JVC

SERVICE MANUAL

VIDEO CASSETTE RECORDER VHS

HR-D230E/EG/EK

HQ

READY
VPSystem
VIDEO PROGRAM

SPECIFICATIONS

Format : VHS PAL standard
Recording system : Rotary, slant azimuth two-head helical scan system with two pairs of video heads, one for the SP mode and the other for the LP mode
Video signal system : PAL colour and CCIR monochrome signals, 625 lines
Tape width : 12.65 mm
Playing time (SP) : 240 min. with E-240 video cassette
(LP) : 480 min. with E-240 video cassette
Temperature
Operating : 5°C to 40°C
Storage : -20°C to 60°C
Channel coverage : VHF 47 – 89 MHz,
104 – 300 MHz,
302 – 470 MHz
UHF 470 – 862 MHz
Aerial output : UHF channels 32 – 40 (adjustable)
Power consumption : 31 watts
Power requirement : 220 V∿, 50/60 Hz

Video

Input : 0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output : 1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio : 43 dB (Rohde & Schwarz noise meter) with picture SHARPNESS control at centre position
Horizontal resolution : More than 250 lines with picture SHARPNESS control at centre position

Audio

Input : AUDIO connector (5-pin DIN): -8 dBs, more than 50 k-ohms, unbalanced
AUDIO/VIDEO socket (21-pin Peri connector): -3.8 dBs (CENELEC standard), more than 10 k-ohms, unbalanced
Output level : AUDIO connector (5-pin DIN): -6 dBs, high impedance load
AUDIO/VIDEO socket (21-pin Peri connector): -3.8 dBs (CENELEC standard), high impedance load
Output impedance : Less than 1 k-ohm, unbalanced
Signal-to-noise ratio : More than 40 dB
Frequency range : 70 Hz to 10,000 Hz
Timer : 1-Year/8-event timer
Dimensions : 435 mm(W) x 95 mm(H) x 341 mm(D)
Weight : 7,2 kg
Provided accessories : Aerial cable, Infrared remote control unit, "R6" battery x 2
Optional accessory : VPS unit VU-V90E

Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

COPYRIGHT © 1987 VICTOR COMPANY OF JAPAN, LTD.

No. 82011
July 1987

NOTE: For a technical description, please refer to Technical Guide VTG82006 HR-D230 PAL.

TABLE OF CONTENTS

Section **Title** **Page**

Important Safety Precautions

INSTRUCTIONS

1. MECHANISM ADJUSTMENT

1.1 GENERAL 1-1
1.2 MAIN ASSEMBLY REPLACEMENT 1-4
1.3 ASSEMBLY PROCEDURE OF MECHANISM 1-5
1.4 CONFIRMATION AND ADJUSTMENT 1-6
1.5 TAPE TRANSPORT SYSTEM CONFIRMATION AND ADJUSTMENT 1-7
1.6 INTERCHANGEABILITY CONFIRMATION AND ADJUSTMENT 1-8

2. ELECTRICAL ADJUSTMENTS

2.1 PREPARATION 2-1
2.2 SERVO CIRCUIT 2-3
2.3 PRE/REC CIRCUIT 2-3
2.4 VIDEO CIRCUIT 2-4
2.5 AUDIO CIRCUIT 2-6
2.6 TIMER CIRCUIT 2-6
2.7 TUNER/IF CIRCUIT 2-6

3. CHARTS AND DIAGRAMS

3.1 CIRCUIT BOARD LOCATIONS 3-1
3.2 GENERAL INFORMATIONS 3-1
3.3 ABBREVIATIONS USED IN THE SCHEMATIC DIAGRAM 3-2
3.4 MAIN TYPES OF ACTIVE AND PACKAGE CIRCUIT 3-3
3.5 BOARD INTERCONNECTION DIAGRAM 3-4
3.6 AUDIO BLOCK DIAGRAM 3-5
3.7 SERVO BLOCK DIAGRAM 3-6
3.8 MECHANISM CONTROL BLOCK DIAGRAM 3-7
3.9 VIDEO (LUMINANCE) AND PRE/REC BLOCK DIAGRAM 3-8
3.10 VIDEO (COLOR) BLOCK DIAGRAM 3-9
3.11 TIMER, DISPLAY/SWITCH AND OPERATION BLOCK DIAGRAM 3-10
3.12 TUNER/IF BLOCK DIAGRAM 3-11
3.13 POWER SUPPLY SCHEMATIC DIAGRAMS 3-12
3.14 POWER SUPPLY CIRCUIT BOARDS 3-13
3.15 AUDIO SCHEMATIC DIAGRAM 3-14
3.16 AUDIO AND AUDIO/CONTROL HEAD CIRCUIT BOARDS 3-15
3.17 SERVO SCHEMATIC DIAGRAM 3-16
3.18 SERVO CIRCUIT BOARD 3-17
3.19 MECHANISM CONTROL SCHEMATIC DIAGRAM 3-18
3.20 MECHANISM CONTROL AND DECK TERMINAL, CASSETTE HOUSING CIRCUIT BOARDS 3-19
3.21 VIDEO (LUMINANCE) SCHEMATIC DIAGRAM 3-20
3.22 VIDEO (COLOR) SCHEMATIC DIAGRAM 3-21
3.23 VIDEO CIRCUIT BOARD 3-22
3.24 VPS SCHEMATIC DIAGRAM AND CIRCUIT BOARD (EG ONLY) 3-23
3.25 PRE/REC SCHEMATIC DIAGRAM 3-24
3.26 PRE/REC AND UPPER DRUM CIRCUIT BOARDS 3-25
3.27 TIMER SCHEMATIC DIAGRAM 3-26
3.28 TIMER CIRCUIT BOARD 3-27
3.29 DISPLAY/SWITCH, OPERATION AND IFR SCHEMATIC DIAGRAMS 3-28
3.30 DISPLAY/SWITCH, OPERATION AND IFR CIRCUIT BOARDS 3-29
3.31 MOTHER SCHEMATIC DIAGRAM 3-30
3.32 MOTHER CIRCUIT BOARD 3-31
3.33 TERMINAL SCHEMATIC DIAGRAM 3-32
3.34 TERMINAL CIRCUIT BOARD 3-33
3.35 TUNER/IF SCHEMATIC DIAGRAM (E/EG MODELS) 3-34
3.36 TUNER/IF SCHEMATIC DIAGRAM (EK MODEL) 3-35
3.37 TUNER/IF CIRCUIT BOARD 3-36
3.38 RF CONVERTER AND MIX BOOSTER SCHEMAITIC DIAGRAM 3-37
3.39 REMOTE CONTROL SCHEMAITC DIAGRAM 3-38

4. EXPLODED VIEWS AND PARTS LIST

4.1 STANDARD PART NUMBER CODING 4-1
4.2 CABINET ASSEMBLY <M2> 4-2
4.3 CHASSIS ASSEMBLY <M3> 4-3
4.4 MECHANISM ASSEMBLY <M4> 4-4
4.5 REMOTE CONTROL UNIT <RM> 4-6
4.6 PACKING ASSEMBLY <M1> 4-7

5. ELECTRICAL PARTS LIST

5.1 STANDARD PARTS NUMBER CODING 5-2
POWER SUPPLY BOARD ASSEMBLY <01><02> 5-6
  POWER TRANSFORMER BOARD ASSEMBLY <01> 5-6
  REGULATOR BOARD ASSEMBLY <02> 5-6
MAIN BOARD ASSEMBLY <03><04> 5-6
  VIDEO BOARD ASSEMBLY <03> 5-6
  MECHACON BOARD ASSEMBLY <04> 5-11
  VIDEO SUB BOARD ASSEMBLY 5-12
MOTHER BOARD ASSEMBLY <05> 5-12
TERMINAL BOARD ASSEMBLY <06> 5-12
TUNER/IF BOARD ASSEMBLY <07> 5-13
SERVO BOARD ASSEMBLY <08> 5-15
AUDIO BOARD ASSEMBLY <09> 5-16
AUDIO/CTL HEAD BOARD <12> 5-17
TIMER BOARD ASSEMBLY <15> 5-17
VPS BOARD ASSEMBLY (EG ONLY) <18> 5-18
OPERATION BOARD ASSEMBLY <22> 5-18
DISPLAY/SWITCH BOARD ASSEMBLY <28> 5-19
UPPER DRUM BOARD <41> 5-19
PRE/REC BOARD ASSEMBLY <43> 5-20
DECK TERMINAL BOARD ASSEMBLY <51> 5-20
RELAY BOARD ASSEMBLY <52> 5-20
REC SAFETY BOARD ASSEMBLY <53> 5-20
END SENSOR BOARD ASSEMBLY <54> 5-21
CASSETTE HOUSING BOARD <56> 5-21
REMOTE CONTROL BOARD ASSEMBLY <RM> 5-21

Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.
2. Parts identified by the ⚠ symbol and shaded (▨) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.
3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors
5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

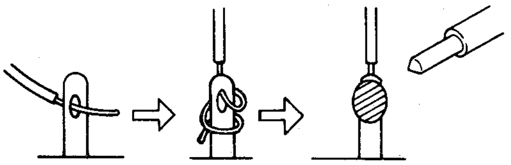


Fig. 1

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)
7. Check that replaced wires do not contact sharp edged or pointed parts.
8. When a power cord has been replaced, check that 10—15 kg of force in any direction will not loosen it.

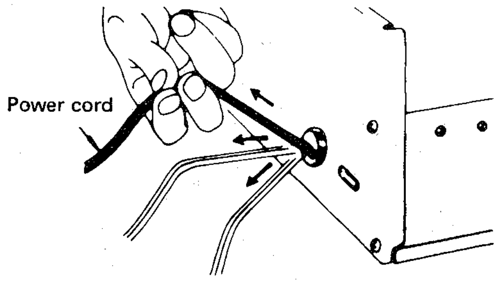


Fig. 2

9. Also check areas surrounding repaired locations.
10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the specified parts. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.
11. Crimp type wire connector
    In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.
    1) **Connector part number :** E03830-001
    2) **Required tool :** Connector crimping tool of the proper type which will not damage insulated parts.
    3) **Replacement procedure**
       (1) Remove the old connector by cutting the wires at a point close to the connector.
       Important : Do not reuse a connector (discard it).

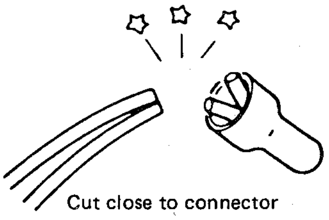


Fig. 3

(2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.

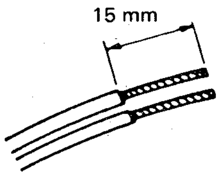


Fig. 4

(3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.

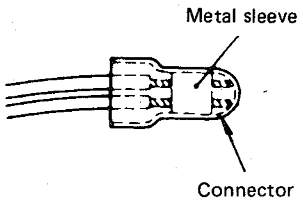


Fig. 5

(4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.

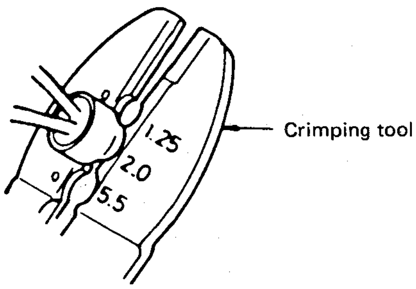


Fig. 6

(5) Check the four points noted in Fig. 7.

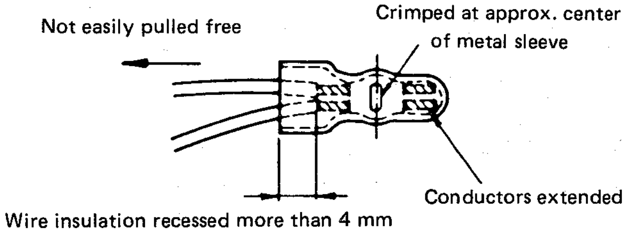

Not easily pulled free
Crimped at approx. center of metal sleeve
Conductors extended
Wire insulation recessed more than 4 mm

Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions, Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**
   Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. **Dielectric strength test**
   Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

3. **Clearance distance**
   When replacing primary circuit components, confirm specified clearance distance (d), (d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

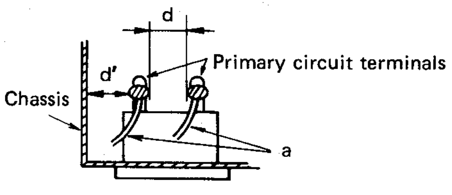


Fig. 8

4. **Leakage current test**
   Confirm specified or lower leakage current between B (earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

   Measuring Method: (Power ON)
   Insert load Z between B (earth ground, power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

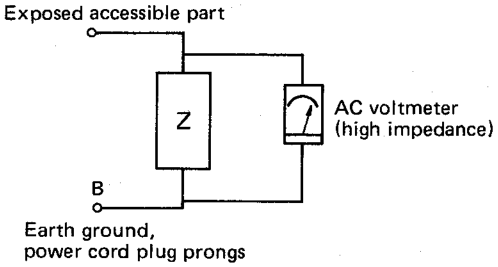


Fig. 9

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance (d), (d')
100 V	Japan	≧ 1 mΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	–	900 V 1 minute	≧ 3.2 mm
*110 to 130 V 200 to 240 V	Europe Australia	≧ 10 mΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

*Class II model only.

Table 1 Ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (b) to:
100 V	Japan	1 kΩ	i ≦ 1 mA rms	Exposed accessible parts
110 to 130 V	USA & Canada	0.15 µF 1.5 kΩ	i ≦ 0.5 mA rms	Exposed accessible parts
110 to 130 V 220 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Other terminals

Table 2 Leakage current ratings for selected areas

Note: This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

CONTENTS

Features 2
Precautions 3
Controls, indicators and connectors 4
Connections 6
Video channel setting 6
Operating the built-in tuner 7
Clock setting 9
Loading and unloading a cassette 9
Playing back a video cassette 10
Recording TV programmes 11
Counter Go-To and counter search 12
Remaining tape time indicator 12
Next-function memory 12
Automatic timer recording 13
VPS recording 15
Recording from an external source 15
In case of difficulty 16
Head cleaning 16
Specifications 16

SAFETY PRECAUTIONS

The rating plate and the safety caution are on the rear of the unit.

WARNING – DANGEROUS VOLTAGE INSIDE
WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

IMPORTANT (In the United Kingdom)
Mains Supply (240 V∿, 50 Hz only)

IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:

Blue to N (Neutral) or Black
Brown to L (Live) or Red

If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal coded L (Live) or coloured Red.
If in doubt – consult a competent electrician.

Note
We recommend that you should disconnect the AC cord from the outlet.

CAUTION

- Disconnect the mains plug from the supply socket when not in use.
- When you are not using the HR-D230E for a long period of time, it is recommended that you disconnect the power cord from the AC outlet.
- Dangerous voltage inside. Refer internal servicing to qualified service personnel. To prevent electric shock or fire hazard, remove the power cord from the AC outlet prior to connecting or disconnecting any signal lead or aerial.

VHS PAL HQ

- Only cassettes marked "VHS" can be used with this video cassette recorder.
- HQ VHS is compatible with existing VHS equipment.

FOR YOUR SAFETY (in Australia)
Install any external aerial to AS 1417.1

Omkopplaren OPERATE på denna apparat är sekundärt kopplad och skiljer inte apparaten från nätet i läge OPERATE OFF.

The OPERATE button does not completely shut off mains power from the unit, but switches operating current on and off.

BEMAERK: I stilling OFF er apparatet stadig forbundet med lysnettet Hvis det ønskes fuldstændig afbrudt skal netledningen trækkes ud.

This unit is produced to comply with Directive 82/499/EEC.

Video tapes recorded with this video recorder in the LP (Long Play) mode cannot be played back on a single-speed video recorder.

COPYRIGHT © 1987 VICTOR COMPANY OF JAPAN, LTD.
JVC Printed in Japan

FEATURES

High-quality pictures

- **HQ (High Quality) System technologies** with a Detail Enhancer, and 20 % higher white clip level.
- **4-Head system** for quality recording and playback in both SP (Standard Play) and LP (Long Play) modes.

Tuner features

- **PLL frequency synthesized wide-band cable tuner** with 48-channel storage capacity.
- **Pretuned to European television broadcast frequencies:** VHF, UHF and cable channels including those of **hyper band.**
- **10-Key random-access channel selection** and up/down scan tuning.
- **Compatible with VPS (Video Programme System)** through use of an optionally available VPS adapter. (VPS programmes are broadcast on TV stations in certain areas.)

Remote control features

- **Independent timer programming** with LCD and built-in 4-programme memory.
- **10-Key random-access channel selection** and up/down scanning.
- **TV control** for power on/off, volume and channel selection (designated JVC TV models only).

Convenient automatic functions

- **Auto play function:** insert a cassette (with safety tab removed), and playback will start automatically.
- **Next-function memory** allows a command to be entered immediately after pressing REW (or FF), with the second command "remembered" and performed automatically after the tape rewinds to its beginning or fast-forwards to the counter reading of "0000".
  - Memory play: for automatic start of playback.
  - Memory eject: to eject the cassette after rewind, without waiting for completion of rewind.
  - Memory timer standby: to engage the timer recording standby mode after rewind.
  - Memory power-off: to turn the power off after rewind.
- Automatic backspace editing.
- Auto-power-on convenience.
- Power-off ejection.
- Automatic rewind at the end of tape.

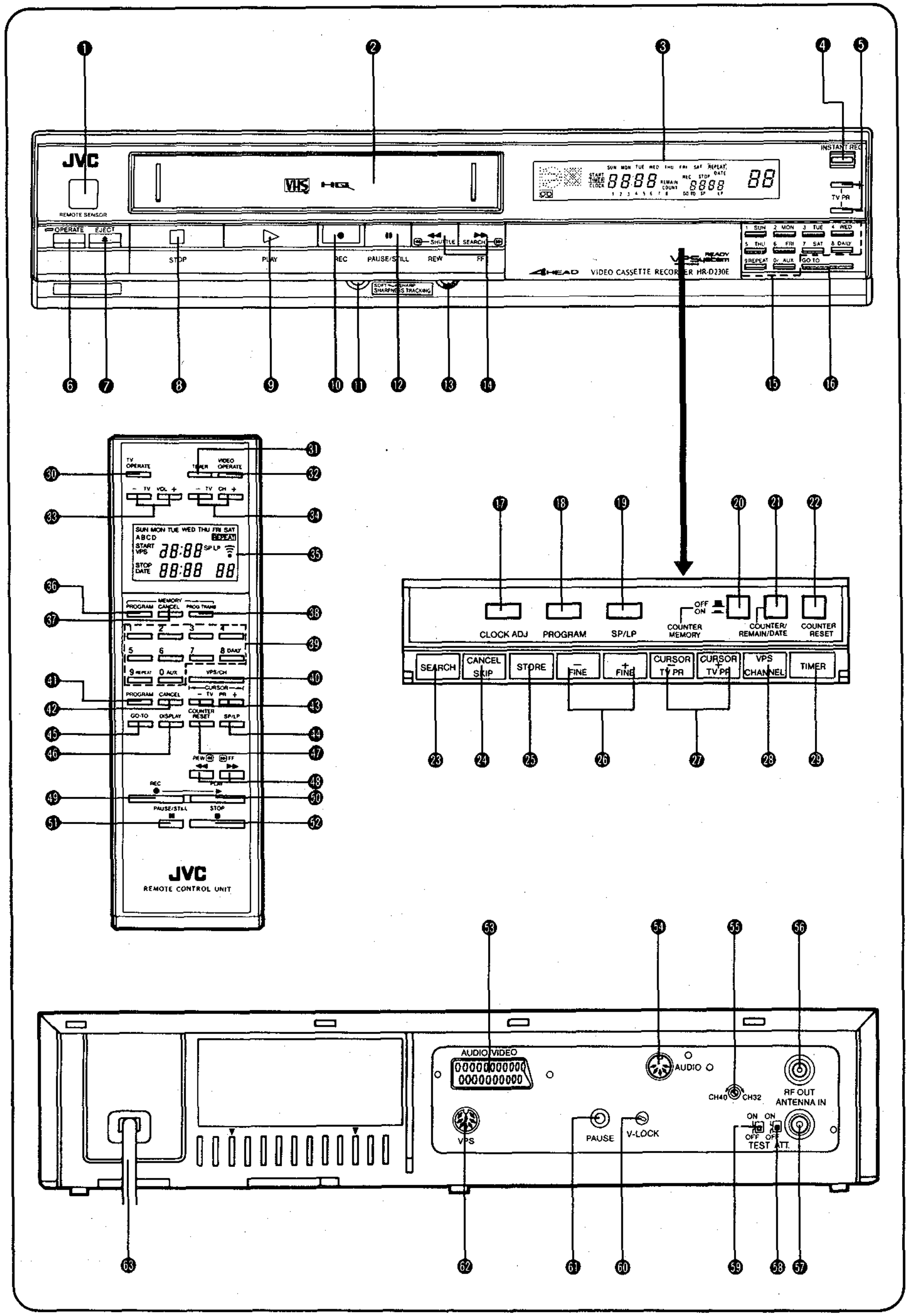
Other value features

- **1-Year/8-event remote-programmable timer** with SP/LP programming.
- **Counter go-to function** permits direct access to any point on a tape specified by keying in a counter number with the 10-digit keypad.
- **On-screen record-pause mode display.**
- Instant recording function with auto shut-off.
- **Shuttle Search with latch function:** with the Shuttle Search button locked or held depressed, offers high-speed playback at 9 times normal speed in SP and LP modes.
- Counter memory for returning to a designated point on a tape.
- Still and frame advance in SP and LP modes.
- Picture sharpness control.
- Comprehensive fluorescent display with symbolic mode indicators.
- Remaining tape time indicator.

Thank you for purchasing the JVC HR-D230E Video Cassette Recorder. Before use, read this instruction booklet carefully for obtaining the best results from your new unit.

Diagrams are on the reverse side of this page. Fold it out and keep it opened so that you can refer to the diagrams when you are reading this booklet.

ENGLISH INSTRUCTIONS .... Page 1 — 16


①
②
③
④
⑤
JVC
REMOTE SENSOR
VHS HQ
SUN MON TUE WED THU FRI SAT REPEAT DATE
START TIMER CLOCK
REMAIN COUNT
REC STOP
GO TO SP LP
INSTANT REC
TV PR
OPERATE
EJECT
STOP
PLAY
REC
PAUSE/STILL
SHUTTLE
SEARCH
REW
FF
SOFT SHARP SHARPNESS TRACKING
4HEAD
VIDEO CASSETTE RECORDER HR-D230E
VPS READY system
1 SUN
2 MON
3 TUE
4 WED
5 THU
6 FRI
7 SAT
8 DAILY
9 REPEAT
0/ AUX
GO TO
⑥
⑦
⑧
⑨
⑩
⑪
⑫
⑬
⑭
⑮
⑯
⑰
⑱
⑲
⑳
㉑
㉒
CLOCK ADJ
PROGRAM
SP/LP
OFF
ON
COUNTER MEMORY
COUNTER/ REMAIN/DATE
COUNTER RESET
SEARCH
CANCEL SKIP
STORE
− FINE
+ FINE
CURSOR − TV PR
CURSOR + TV PR
VPS CHANNEL
TIMER
㉓
㉔
㉕
㉖
㉗
㉘
㉙
㉚
㉛
㉜
㉝
㉞
㉟
㊱
㊲
㊳
㊴
㊵
㊶
㊷
㊸
㊹
㊺
㊻
㊼
㊽
㊾
㊿
(51)
(52)
TV OPERATE
TIMER
VIDEO OPERATE
− TV VOL +
− TV CH +
SUN MON TUE WED THU FRI SAT
ABCD
REPEAT
START VPS
STOP DATE
SP LP
MEMORY
PROGRAM
CANCEL
PROG TRANS
1
2
3
4
5
6
7
8 DAILY
9 REPEAT
0 AUX
VPS/CH
CURSOR
− TV PR +
PROGRAM
CANCEL
GO-TO
DISPLAY
COUNTER RESET
SP/LP
REW
FF
REC
PLAY
PAUSE/STILL
STOP
JVC
REMOTE CONTROL UNIT
(53)
(54)
(55)
(56)
AUDIO/VIDEO
AUDIO
CH40
CH32
RF OUT
ANTENNA IN
VPS
PAUSE
V-LOCK
ON ON
OFF OFF
TEST ATT.
(63)
(62)
(61)
(60)
(59)
(58)
(57)

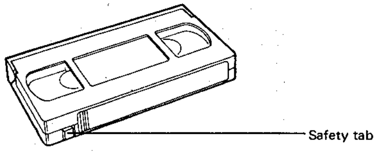
PRECAUTIONS

Handling and storage

- Avoid using the recorder under the following conditions:
  - extremely hot, cold or humid places,
  - dusty places,
  - near appliances generating strong magnetic fields,
  - places subject to vibrations, and
  - poorly ventilated places.
- Be careful of moisture condensation.
  Avoid using the recorder immediately after moving from a cold place to a warm place or soon after heating a room which was cold. The water vapour in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.
- Handle the recorder carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Use in horizontal (flat) position only.
- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Video cassettes

- This recorder employs VHS-type cassettes only.
  E-240 for 4 hours/8 hours, E-180 for 3 hours/6 hours, E-120 for 2 hours/4 hours, E-90 for 1 hour and 30 minutes/3 hours, E-60 for 1 hour/2 hours and E-30 for 30 minutes/1 hour of recording.
- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.



- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.

Moisture condensation

- If you pour a cold liquid into a glass, water vapour in the air will condense on the surface of the glass. This is called moisture condensation.
- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.
- Moisture in the air will condense on the recorder when you move it from a cold place to a warm place, after heating a cold room or under extremely humid conditions.
- This recorder is equipped with a moisture condensation prevention circuit which automatically heats the head drum according to the ambient temperature. This circuit operates when the unit is plugged into an AC outlet.
- The moisture condensation prevention circuit consumes only a slight amount of power. However, if for some reason you are not using the recorder for a long period of time, it is advisable to remove the power cord from the AC outlet.
- Since the moisture condensation prevention circuit cannot evaporate existing moisture condensation immediately after the power cord has been plugged into the AC outlet, you must allow for a few hours if the recorder is to be used in such areas as would occasion moisture condensation.

Operation

- When a cassette is loaded, the power is switched on automatically.
- The cassette can be unloaded even when the power is off. Pressing the EJECT button turns the power on and, after ejection of the cassette, shuts it off automatically in this case.
- As long as the TIMER button is engaged with the TIMER indicator lit, the OPERATE and EJECT buttons have no effect and unloading of a cassette is not possible. If a cassette has not yet been inserted, simply insert a cassette; the power will be switched on to load the cassette properly and, after completion of automatic loading, the Timer Recording Standby mode will be engaged with power off.

Remote control unit

- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

WARNING

1. This recorder can also receive colour television signals in East Germany (DDR) for recording and playback.
2. Recordings made of DDR television signals produce monochrome pictures if played back on another video recorder of PAL or SECAM standard.
3. SECAM prerecorded cassettes or recordings made with a SECAM video recorder produce monochrome pictures when played back with this recorder.
4. This recorder cannot be used in France. Use a SECAM recorder to record French SECAM signals.

IMPORTANT: It is permissible to record television programmes only in the event that third party copyrights and other rights are not violated.

CONTROLS, INDICATORS AND CONNECTORS

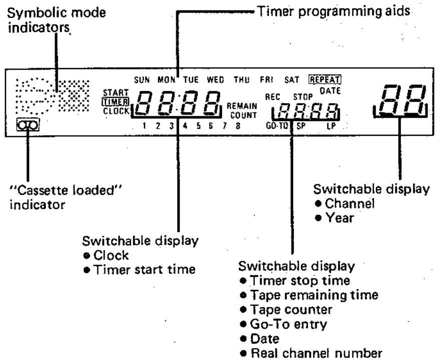
Refer to the diagrams on the front foldout page.

Front Panel

① Infrared beam receiving window (REMOTE SENSOR)

② Cassette loading slot
Insert a VHS cassette. The door will close and the "cassette loaded" indicator will appear on the FDP (fluorescent display panel).

③ Fluorescent display panel
Fully explained in relevant sections.



④ INSTANT REC button
Use this button to start recording instantly and stop automatically after a specific time. (See page 11.)

⑤ TV PR. +/– buttons
Press either button to scan to a desired channel.

⑥ OPERATE button with LED indicator
Press to apply operating power to the recorder. The indicator will light. Loading a cassette also turns the power on.

⑦ Cassette EJECT button

⑧ STOP button
Press to stop the tape.

⑨ PLAY button
Press to play back the tape or cancel the Pause/Still and Search modes.

⑩ REC button
Press together with the PLAY button ⑨ for recording.

⑪ Picture SHARPNESS control
Turn this knob counterclockwise to make the picture sharper. Turn clockwise to give the picture a softer tone. Effective only for playback pictures. (No effect for recording.)

⑫ PAUSE/STILL button
Press to stop the tape temporarily to avoid recording of unwanted material or to view a still picture. The still picture can be advanced step by step or continuously.

⑬ TRACKING control
Turn to minimise noise bars, if observed, during playback.

⑭ REW and FF (SHUTTLE SEARCH) buttons
Press while in the Stop mode to rewind or fast-forward the tape; press while in the Play mode to view the speeded-up picture for programme search. See pages 10 and 12.

⑮ Multi-purpose numeric keys

Channel selection:	See page 7.
Clock setting:	See page 9.
Timer programming:	See pages 13 and 14.
Counter Go-To:	See page 12.
External source recording:	See page 15.

⑯ GO TO button
Press to engage the counter Go-To mode. See page 12.

⑰ CLOCK ADJ button
Press to adjust the clock.

⑱ PROGRAM button
Press to programme the timer.

⑲ SP/LP button
Press to select the recording mode (SP or LP).

⑳ COUNTER MEMORY button
When this button is pressed to ON (▬), the tape will stop automatically at the counter reading of about "0000" in the Rewind or Fast Forward mode.

㉑ COUNTER/REMAIN/DATE button
Press to change the display from the Timer Set mode to the Clock mode. Usually use this button to switch the middle 4-digit display to tape counter (COUNT), remaining tape time (REMAIN) and date (DATE).

㉒ COUNTER RESET button
Press to reset the tape counter reading to "0000".

㉓ SEARCH button
Press to initiate automatic scan tuning in the Real-channel mode. (See pages 7 and 8.)

㉔ CANCEL/SKIP button
A dual-purpose switch. Use to clear the programmed data in the Timer Set mode or skip unnecessary channels in the Channel Set mode. (See page 8 or 14.)

㉕ STORE button
Press to store necessary channels. (See page 8.)

㉖ FINE (–, +) buttons
To fine-tune in to a certain station by shifting the frequency in both directions. (See page 8.)

㉗ CURSOR/TV PR (–, +) buttons
Press either button to scan to a desired channel. These buttons can also be used as cursor keys for 10-key programming.

㉘ VPS/CHANNEL button
Allows for VPS programming when pressed in the Timer Set mode. In all other modes, this button functions to engage the tuner in the Real-channel mode. (See pages 7, 8 and 15.)

㉙ TIMER button
Press to engage the timer recording standby mode.

Remote Control Unit

㉚ **TV OPERATE button**
Press to turn the TV power on or off. (Designated TV models only.)

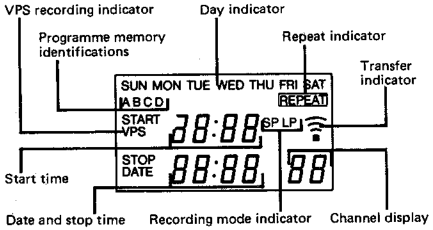
㉛ **TIMER button**
Press to engage the timer recording standby mode.

㉜ **VIDEO OPERATE button**
Press to turn the recorder power on or off.

㉝ **TV VOL. buttons**
Press "–" or "+" to decrease or increase the TV's sound volume.

㉞ **TV CH buttons**
Press to select a desired channel on the TV receiver.

㉟ **LCD (Liquid Crystal Display) panel**
Refer to this panel when programming the remote control's built-in timer memory.



㊱ **MEMORY PROGRAM button**
Press to programme the remote control's timer memory.

㊲ **MEMORY CANCEL button**
Press to cancel the programmed data in the remote control's timer memory.

㊳ **PROG. TRANS button**
Press to transfer the data held in the memory to the recorder.

㊴ **Multi-purpose numeric keys**

㊵ **VPS/CH button**

㊶ **PROGRAM button**
Press to programme the recorder's timer memory directly from the remote control.

㊷ **CANCEL button**
Press to cancel the programmed data held in the recorder's timer memory.

㊸ **CURSOR/TV PR. buttons**

㊹ **SP/LP button**

㊺ **GO-TO button**

㊻ **DISPLAY button**
Functions in the same way as the COUNTER/REMAIN/DATE button ㉑.

㊼ **COUNTER RESET button**

㊽ **REW and FF (SHUTTLE SEARCH) buttons**

㊾ **REC button**

㊿ **PLAY button**

(51) **PAUSE/STILL button**

(52) **STOP button**

Rear Panel

(53) **AUDIO/VIDEO socket**
A 21-pin standardised audio/video input/output socket for the connection to a TV or a 2nd video recorder equipped with the same type of socket. The input from this socket can be recorded in the AUX mode engaged by obtaining "AU" in the channel display.

Remote Control Unit

A/B mode switching
A switch on the back of the remote control labelled A/B is accessible when the battery compartment cover is removed.

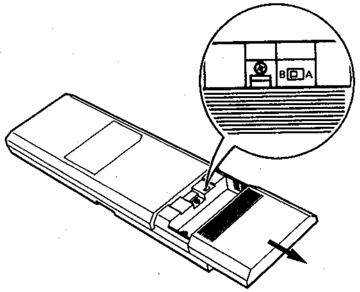
- This switch is preset to the "A" position. Do not touch it unless you use two JVC video decks side by side.
- When you place two JVC video decks near each other, use this remote control in the "B" mode to prevent both decks from responding simultaneously to this remote control's signals. For this purpose, carefully follow the instructions below:

(1) Unplug the power cord of the HR-D230E from the AC outlet.
(2) Set the remote control unit's A/B mode switch to "B".
(3) Plug the power cord of the HR-D230E into the AC outlet.
(4) Turn on the power of the HR-D230E using the remote control's VIDEO OPERATE button.
- The HR-D230E "memorises" this B code and then will respond only to the signals of this remote control unit. The other deck will respond only to its remote control.

Note:
Do not operate other remote controls after you have plugged the HR-D230E into the AC outlet and before you press the VIDEO OPERATE button of this remote control.

Operating distance for remote control unit
- The maximum operating distance is about 8 m.

Installing the batteries
- Insert two "R6"-size batteries (provided) into the battery compartment on the rear of the remote control unit, observing correct polarity.



(54) **AUDIO input/output DIN socket**
Connect a tape recorder or other audio sources or connect the audio output of other video sources for recording. The input from this socket can be recorded in the AUX mode with "AU" in the channel display. Also, audio signals being recorded or played back are available from the output terminals of this DIN socket.

(55) **RF converter frequency adjustment screw**

(56) **RF OUT connector**
Connect to the aerial terminal of a TV receiver through the aerial cable (provided).

(57) **Aerial input connector (ANTENNA IN)**
Connect an aerial to this connector.

(58) **Attenuator switch (ATT)**
Set to OFF to receive broadcasts from distant stations. Set to ON to receive broadcasts of high field strength.

(59) **TEST signal switch**
Set to ON when tuning your TV receiver for the video channel. A test signal in the form of two vertical white bars will be available.

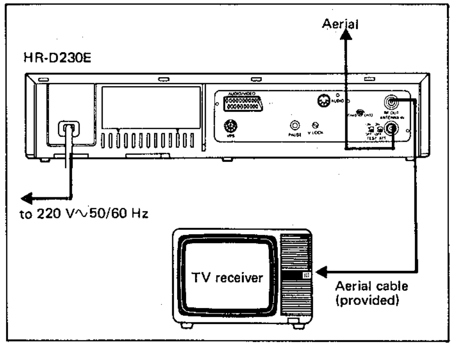
(60) **V-LOCK adjustment screw**
When operating in the Still mode, adjust this screw to eliminate any vertical vibration of the picture. (For any inquiry about this adjustment, contact a JVC dealer.)

(61) **Remote PAUSE control terminal**
When using a JVC video camera, connect the remote control cable of the camera adapter to this terminal for the purpose of controlling the starting and stopping of the tape with the camera's start/stop switch.

(62) **VPS connector**
Connect a VPS unit (optional, VU-V90E) if VPS broadcasts are receivable. For connection, refer to the manual of the VPS unit.

(63) **Power cord**

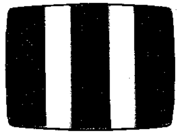
CONNECTIONS



1. Remove the aerial cable from the TV receiver and reconnect it to the recorder's ANTENNA IN connector (57). The recorder is then ready to record off-air programmes.
2. Connect the recorder's RF OUT connector (56) to the TV receiver's aerial terminal using the provided aerial cable. The TV receiver is then ready to receive broadcast programmes as well as accommodate video cassette playback.

VIDEO CHANNEL SETTING

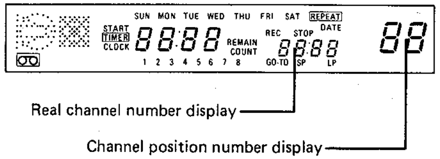
1. Press the OPERATE button ⑥ to turn the power on. Turn on the TV receiver.
2. Set the TEST switch (59) to ON.
3. Adjust your TV receiver in the vicinity of UHF channel 36 until you bring in the two white signal bars on the screen as illustrated. This is your VIDEO CHANNEL.
4. Reset the TEST switch to OFF.



Notes:
- If some interference noise is seen on the screen because of broadcasts on neighbouring channels or if your preset broadcasts should be affected in picture quality, it is necessary to shift the RF converter output frequency from that of channel 36. Consult your JVC dealer for making this adjustment.
- Video channel setting is also possible using a prerecorded VHS video cassette. Play back the tape and tune the TV receiver to obtain clear pictures and sound while monitoring the playback picture on the TV screen.
- If your TV receiver is not provided with an AFC circuit, perform fine tuning of the TV receiver when you are actually viewing video cassettes.

OPERATING THE BUILT-IN TUNER

The HR-D230E incorporates an advanced frequency synthesized tuner which is pretuned to 112 channels to cover VHF, UHF and CATV broadcasts. Channel indication is given in two different ways: real channel numbers and channel position numbers. Real channel number indication is available by pressing the VPS/CHANNEL button ㉘, while channel position number indication is always available in the channel display.


SUN MON TUE WED THU FRI SAT REPEAT
START
TIMER
CLOCK
8 8·8 8
REMAIN
COUNT
REC STOP DATE
8 8·8 8
1 2 3 4 5 6 7 8
GO-TO SP LP
88
Real channel number display
Channel position number display

Correspondence between 112 pretuned TV stations and the HR-D230E's real channel indications

DISPLAY	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ch	–	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	A	B	C	D	E	F	G	H
CC	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
DISPLAY	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Ch	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	E37	E38	E39	E40
CC	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
DISPLAY	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ch	E41	E42	E43	E44	E45	E46	E47	E48	E49	E50	E51	E52	E53	E54	E55	E56	E57	E58	E59	E60
CC	S41	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
DISPLAY	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**			**75**	**76**	**77**						
Ch	E61	E62	E63	E64	E65	E66	E67	E68	E69			–	–	–						
CC	–	–	–	–	–	–	–	–	–			X	Y	Z						

Stored channels

A total of 112 channels are receivable. Of them, up to 48 can be stored for easy channel selection. Prior to shipment, some channels are stored.

It is possible to store more channels or skip some channels if there are no broadcasts on those channels in your area. It is possible to change the stored channels to correspond to your preferred channel allocation. Skipped channels can be restored whenever necessary.

- Channel memories are permanent; the programmed channel allocation will not be erased even if the recorder is unplugged from the AC outlet.

Channel selection

To select a channel for recording, normally use the TV PR. -/+ buttons ❺ or 10 numeric keys ⓯. You can choose any channel from among the stored ones by calling up the corresponding channel position number.

- Use the TV PR. "-" button to scan to a channel in the direction of decreasing numbers; the TV PR. "+" button, in the direction of increasing numbers.
- When using the 10 numeric keys, pay attention to the following: When 1, 2, 3 or 4 is entered, it blinks for about 2 seconds. To set channel 1, 2, 3 or 4, leave it blinking until it remains lit. To key in a two-digit number, enter the 2nd number while 1, 2, 3 or 4 is blinking. The number entered first will be shifted to the tens place and channels 10 to 48 can be set. If you enter an invalid number (larger than 48), the channel display will return to the previous figure after 2 seconds.

If you want to select a channel other than those stored, engage the Real Channel mode and call up a channel, while referring to the real channel number display.

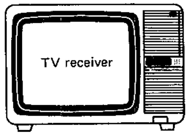
With recorder's controls:

- Press the VPS/CHANNEL button ㉘ to engage the Real Channel mode and call up a channel by either pressing the SEARCH button ㉓ or using the 10 numeric keys.

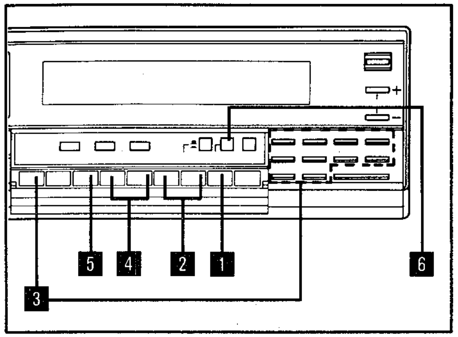
With remote control:

- Press the VPS/CH button ㊵ to engage the Real Channel mode and call up a channel by using the 10 numeric keys.

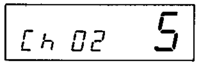
Changing the stored channels



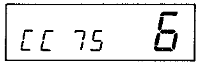
Turn the TV receiver to ON and adjust it to your video channel.



1 Press the VPS/CHANNEL button ㉘.
The middle 4-digit display will change to the Real Channel mode and show the band and real channel number of a station stored for that position.



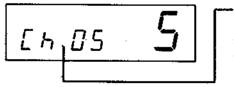
VHF channel 2 is stored for channel position 5.



Cable channel 75 is stored for channel position 6.

2 Call up the channel position number for which you wish to change the stored TV station.
- For this purpose, press either the TV PR. "-" or "+" button. Channel positions from 1 to 48 appear successively. "AU" indicates that the unit is in the external input mode usually referred to as AUX.

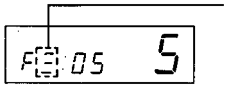
3 Select a TV station which you wish to store into that position.
- Pressing the VPS/CHANNEL button changes the band and alternates the band indication between "Ch" (for VHF and UHF) and "CC" (for Cable). Select the appropriate indication.
- You can scan to the real channel number corresponding to the desired station by pressing the SEARCH button ㉓. Pressing the SEARCH button initiates automatic scanning from real channel number Ch 02 to 69, CC 01 to 41, 75, 76, 77, then back to Ch 02. When a broadcast is detected, scanning stops automatically. To advance to the next station, press the SEARCH button.



"Colon" will appear to indicate that this real channel is not stored for the indicated channel position.

- You can key in that real channel number using 10 numeric keys ⓯. 70, 71, 72, 73, 74 and numbers larger than 77 are invalid numbers. If an invalid number is keyed in, the previously selected channel will be received.

4 If the picture quality is unsatisfactory due to ghosts or other noise, perform fine tuning.
- For this purpose, press either the FINE "-" or "+" button ㉖. The Fine Tuning mode will be engaged.



Upper or lower "-" sign indicates the operating tuning frequency is above or below the standard broadcast frequency.
Centre "-" sign will appear when it corresponds to the standard.

Then press either the FINE "-" or "+" button, depending on the direction of fine adjustment, so that the picture clears up. Each time the button is pressed, the picture condition changes in a single increment. Continuous changing is also possible by keeping the button pressed. If the tuning frequency falls on the next station, the channel number advances as well. If no command is given for 2 seconds after either FINE button has been pressed, the Fine Tuning mode will be automatically cancelled. To cancel the Fine Tuning mode instantly, press the VPS/CHANNEL button.
- If the picture is not clear after all procedures, perform fine tuning on your television.
- Distorted pictures or sound will be recorded if fine tuning has not been properly performed. Exercise care with this adjustment since the recorded picture and sound cannot be adjusted later.

5 After confirming both the real channel number and channel position number, press the STORE button ㉕. "Colon" will disappear.
- The selected station will be stored in memory.

6 Press the COUNTER/REMAIN/DATE button ㉑ to disengage the Real Channel mode.

Skipping the stored channels

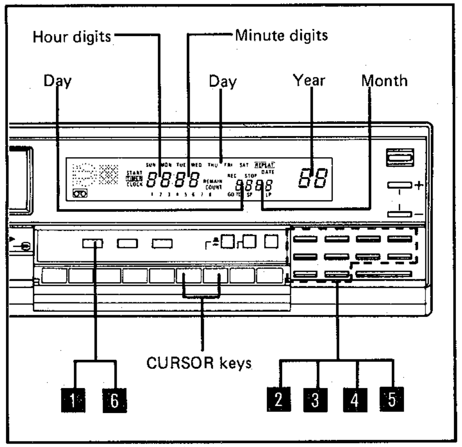
1. Call up the channel position number that you wish to skip by using the TV PR. buttons or 10 numeric keys.
2. Press the VPS/CHANNEL button.
3. Press the SKIP button ㉔.
   "Colon" will appear to indicate that the displayed real channel is not stored.
4. Press the COUNTER/REMAIN/DATE button to disengage the Real Channel mode.
   - The skipped channel number will not appear on the channel display during up/down scan tuning.

Restoring the skipped channels

1. Press the VPS/CHANNEL button to engage the Real Channel mode.
   - In this mode, all channel position numbers 1 through 48 are available in the channel display.
2. Select the channel position number that you wish to restore by using the TV PR. "-" or "+" button.
3. Select a real channel that you wish to restore in that channel position by using the SEARCH button or 10 numeric keys.
4. After confirming both the real channel number and channel position number, press the STORE button.
5. Press the COUNTER/REMAIN/DATE button to disengage the Real Channel mode.

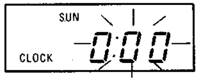
CLOCK SETTING

Plug the HR-D230E into an AC outlet. The display shows a blinking 0 : 00 with SUN and CLOCK illuminated.

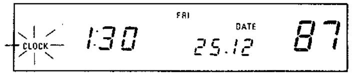


Power failure indicator

The initial condition of the display is also a power failure indicator, showing that there has been a power failure exceeding 10 seconds. Re-adjusting the time restores the normal condition of the clock display.



1. Press CLOCK ADJ ⓱.
   The display will change to the Clock Set mode with "SUN" and "CLOCK" blinking.
2. Press one of the numeric keys "1 (SUN)" to "7 (SAT)" that corresponds to the day of setting. The hour digits will start blinking.
3. Set the hour and minute in that order.
   - The blinking position is ready for entry.
   - To set a one-digit number, first press "0", then press the numeric key for 1 to 9.
   - Zero will not be displayed in the tens place of the hour indication unless the cursor is moved back to the hour digits.
   - For a two-digit number, simply press the corresponding numeric keys in the right order.
   - In hour setting, numbers larger than 23 will be rejected.
   - In minute setting, numbers larger than 59 will be rejected.
4. Set the day and month in that order.
   - The setting method is the same as for time setting.
   - In day setting, invalid numbers such as 32 of January or 30 of February will be rejected.
   - 29 of February will be accepted only during leap years.
   - In month setting, numbers larger than 12 will be rejected.
5. Set the year in the channel display section.
   - Key in only the two last digits of the year.
6. Press CLOCK ADJ.
   - Press it at the exact instant of the time signal, and the clock will be set accurately to the present time.



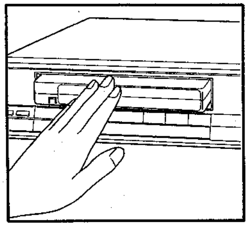
Notes:

- If you press a wrong numeric key, you can return to the previous position using the CURSOR "–" key.
- Once all necessary data have been entered, you can reach any position for correction using the CURSOR "–" and "+" keys.
- Clock setting is not possible during playback, or if the TIMER button is engaged with the TIMER indicator lit. First check to see that the TIMER indicator is off.

LOADING AND UNLOADING A CASSETTE

Loading

Insert a cassette as illustrated. Be sure to insert it firmly into the slot; otherwise, it will be automatically ejected.



- The automatic loading mechanism will operate only when the cassette is inserted correctly.
- With a cassette inserted, the "cassette loaded" indicator will appear on the FDP.

Unloading

Press the EJECT button ❼.

CAUTION

- If unloading of the cassette is not possible, check to see whether the TIMER indicator is lit. If so, press the TIMER button so the TIMER indicator extinguishes.
- Do not attempt to pull out the cassette once automatic loading has started.
- Do not insert fingers or any foreign object beyond the door of the cassette loading slot, as this could lead to injury or damage to the mechanism. Show special caution with children.

PLAYING BACK A VIDEO CASSETTE

AUTO POWER-ON AND AUTO PLAY SYSTEM

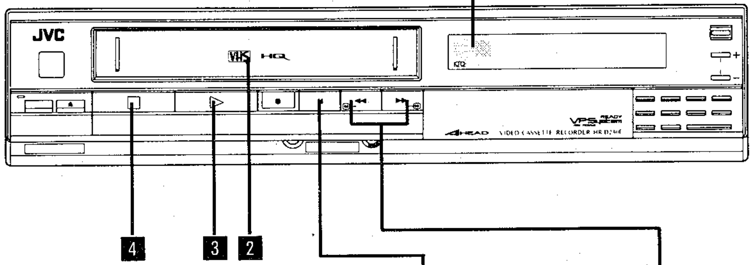
- The cassette can be loaded even when the power has not been turned on. Inserting a cassette into the loading slot turns the power on automatically.
- Inserting a cassette, with its safety tab removed, turns the recorder on and playback of the cassette begins automatically.

POWER-OFF EJECT SYSTEM

- The cassette can be unloaded even after the power has been turned off. Pressing the EJECT button turns the power on automatically and, after ejection of the cassette, shuts it off automatically.

Mode indicator

PLAY:	▷	STILL:	▯▯
REW SHUTTLE SEARCH:	▷ ◁◁	FF SHUTTLE SEARCH:	▷ ▷▷



1. Turn the TV receiver on and adjust it to your video channel.
2. Load a pre-recorded cassette.
   - Power will be switched on automatically.
   - When the cassette loaded has no safety tab, playback will start automatically.
3. Press PLAY ❾.
   - The SP/LP button may be in either position. The SP or LP mode recording is automatically detected and played back at a correct speed respectively with the corresponding indicator lit on the FDP.
4. Press STOP ❽ at the end of the programme.
   - The tape will be rewound automatically when its end is reached and the recorder will enter the Stop mode.

STILL PICTURE

1. Press PAUSE/STILL ⓬ during playback.
2. To advance the still picture, press PAUSE/STILL a number of times.
   - Keeping this button pressed continuously advances the picture to give a slow-motion effect.
3. To cancel the Still mode, press PLAY.

Notes:

- When the Still mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.
- With some televisions, the still picture may be unstable. This is not due to any defect of the unit.

SHUTTLE SEARCH

Shuttle Search allows high-speed playback at 9 times normal speed in either direction.

1. Press either REW or FF SHUTTLE SEARCH ⓮ during playback.
2. To cancel the Search mode, press PLAY.
   - For briefer scanning, keep the SHUTTLE SEARCH button pressed for more than 2 seconds; when you release the button, the Search mode will be cancelled.

Picture Sharpness Adjustment

Images on the screen can be adjusted to a preferred softer or sharper definition by turning the SHARPNESS control ⓫ in the corresponding direction.

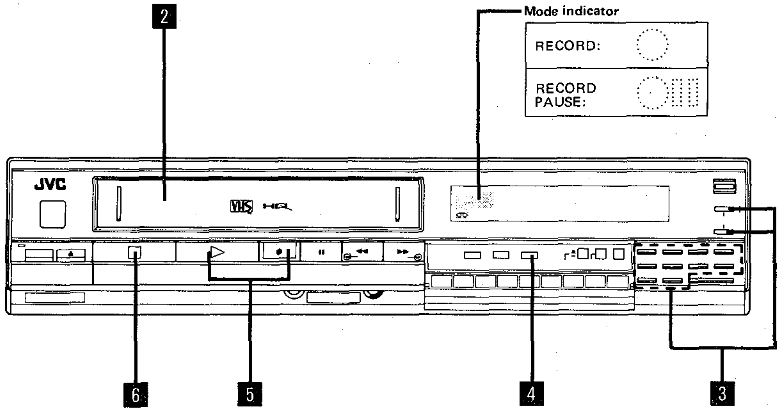
Tracking Adjustment

Noise bars may appear on the screen if you play back a tape which was recorded using another recorder. For correction, adjust the TRACKING control ⓭. Turn it in either direction to adjust the picture. After playing a particular tape, return the control knob to the centre position.

CAUTION:

When a tape recorded from SECAM B/G broadcasts in the LP mode is played back, colours disappear if special-effects (still and shuttle search) are applied.

RECORDING TV PROGRAMMES



1 Turn the TV receiver on and adjust it to your video channel.

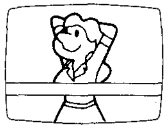
2 Load a cassette (with safety tab in place).
- Power will be switched on automatically.

3 Press either TV PR. ❺ or the numeric keys ⓯ to select the channel you wish to record.

4 Select the recording speed (SP or LP).
SP: 4 hours with an E-240 cassette.
LP: 8 hours with an E-240 cassette.

5 Press REC ❿ and PLAY ❾ simultaneously.
- If there is part of the programme you don't want to record, press PAUSE/STILL ⓬. A white horizontal bar will appear on the screen and in about 5 minutes the Stop mode will be entered automatically.

Pause mode indicator



- To continue recording from the Pause mode, press PLAY ❾ while the white bar is on-screen.

6 Press STOP ❽ at the end of the programme.
- When the end of the tape is reached during recording, the tape is automatically rewound and stops.

Notes:
- When recording is restarted from the Pause mode, a few frames recorded before are erased due to overlap of the new recording. This is not due to any defect of the unit.
- The selected channel cannot be altered during recording. If you wish to change the channel, first engage the Pause mode and then select a different channel.

INSTANT RECORDING

If you need to start recording instantly from other modes or wish for recording to stop automatically after a certain period of time, use this Instant Recording mode.

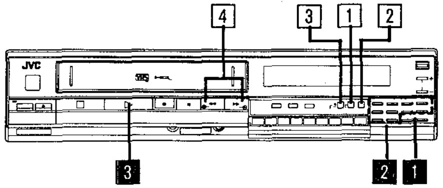
1. Press INSTANT REC ❹.
   - The FDP shows "REC STOP --:--".
2. Press INSTANT REC once again within 10 seconds.
   - Recording will begin and the FDP shows "REC STOP 0:30", indicating that recording will automatically stop and power will switch off after 30 minutes.
3. Adjust the switch-off time, if necessary.
   - Press INSTANT REC to increase the time in 30-minute increments (possible up to 4 hours).
   - Use the numeric keys to set to a more precise time when required (possible up to 9 hours 59 minutes). Always key in a full number including hours and minutes. For "0:35", key in zero first. After setting the time, press INSTANT REC immediately.

Notes:
- Instant recording has priority over all other modes.
- If the INSTANT REC button is pressed with a non-recordable cassette loaded (one with its safety tab removed), the cassette will be automatically ejected.

RECORDING ONE PROGRAMME WHILE WATCHING ANOTHER

A programme not being viewed can be recorded while you enjoy another programme.
- Select the channel you wish to record with the recorder's channel select buttons.
- Select the channel you wish to view with the TV receiver's channel selector.

COUNTER GO-TO AND COUNTER SEARCH



Counter Search

The counter reading of "0000" can be located automatically.

1 Press COUNTER/REMAIN/DATE ㉑ to obtain the Counter mode.

2 Press COUNTER RESET ㉒ during playback or recording at a point which you wish to locate later.

3 Press COUNTER MEMORY ⓴.

4 Press REW or FF ⓮ when you need to return to the designated point.
- The tape will stop automatically at about "0000".
- When used in conjunction with the Memory Play function, this offers more convenience. See below.

Counter Go-To

Specify the desired counter number, and the tape will be fast-forwarded or rewound to that point for automatic playback.

1 Press GO-TO ⓰ in the Stop mode.
- The counter will display the current position of the tape as calculated from the leader at the beginning of the tape.

2 Specify the counter number of the point you wish to locate, using the numeric keys ⓯.

3 Press PLAY ❾.
- The tape will be fast-forwarded or rewound depending on the relative position of the specified point, at which playback will start automatically.

Notes:
- If the recorder has not detected the leader tape since the tape was loaded, no number will be displayed when the GO-TO button is pressed, but after pressing the PLAY button, the tape will be rewound to the beginning (to enable counting from the leader) before fast-forwarding to the desired location.
- If the specified number exceeds the length of the tape, as calculated from the leader, the tape will fast-forward to the end, rewind to the beginning and then enter the Play mode.

REMAINING TAPE TIME INDICATOR

The tape counter is switchable to the remaining tape time indicator.

1. Press COUNTER/REMAIN/DATE ㉑ to obtain the Remain mode.
2. The remaining tape length will be shown in hours and minutes.

Notes:
- During recording, the remaining tape length is calculated in reference to the recording mode selected by the SP/LP button; during playback, it is calculated in reference to the recording mode of the tape being played (SP/LP).
- The indicated remaining time is approximate. The time required to calculate the remaining tape length and the accuracy of that calculation may vary according to the type of cassette tape. (The remaining time indication is not available if this mode is engaged from Fast Forward or Rewind.)

NEXT-FUNCTION MEMORY

Memory Play function

- If you want to watch the tape from its beginning after rewinding, press REW and then PLAY within 2 seconds. Playback will start automatically at the beginning of the tape. (The COUNTER MEMORY button ⓴ must be in the OFF position.)
- If you want to watch the tape from the counter reading of "0000", press COUNTER MEMORY, then REW (or FF) and then PLAY within 2 seconds.
- While the tape is being rewound, the PLAY indicator is blinking. To cancel the Memory Play mode and go to another mode, press the corresponding button (STOP, PLAY, FF, REW).

Memory Eject/Power-Off/Timer Standby

If you are going to eject the cassette, turn the power off or engage the Timer Standby mode after rewinding the tape, you do not have to wait for completion of rewind to press the corresponding button.
- To eject the cassette after rewind, press REW and then EJECT within 2 seconds. (To cancel the Memory Eject mode, press STOP.)
- To turn the power off after rewind, press REW and then OPERATE within 2 seconds. (To cancel the Memory Power-off mode, press OPERATE.)
- To engage the Timer Standby mode after rewind, press REW and then TIMER within 2 seconds. (To cancel the Memory Timer Standby mode, press TIMER.)

Memory Play	REW/FF	→	PLAY	▷ PLAY	Blinking	→	Play mode
Memory Eject	REW	→	EJECT	⌧	Blinking	→	Cassette ejected
Memory Power-off	REW	→	OPERATE	▭ OPERATE	Blinking	→	Power off
Memory Timer Standby	REW	→	TIMER	TIMER	Lights	→	Timer standby mode

within 2 seconds

AUTOMATIC TIMER RECORDING

First of all, load a cassette (with safety tab in place); power will be switched on automatically.

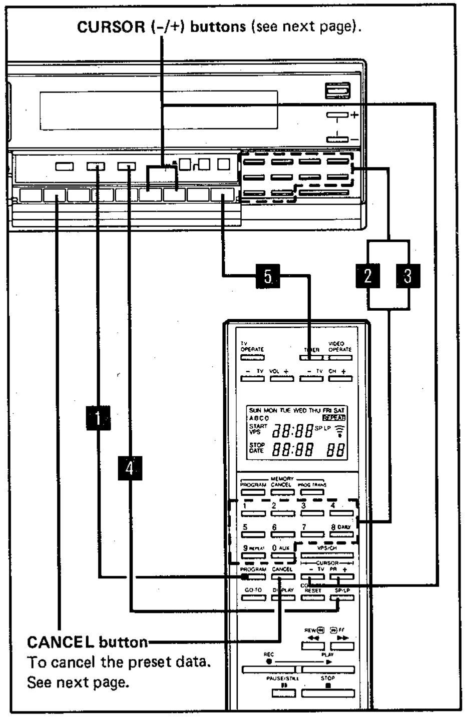
Three ways to perform timer programming

A. **Local programming:** Programme the timer using the recorder's controls while referring to the recorder's FDP.

B. **Direct remote programming:** Programme the timer using the remote control's keys while referring to the recorder's FDP.

C. **Independent remote programming:** Programme the remote control's memory using the remote control's keys while referring to its own LCD and then transfer the data to the recorder.

CURSOR (-/+) buttons (see next page).

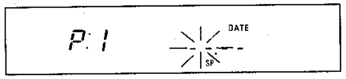


CANCEL button
To cancel the preset data.
See next page.

A. Local Programming

1 Press PROGRAM ⑱.

- The display will change to the Timer Set mode for programme number "1". To advance to programme numbers 2 – 8, press PROGRAM.

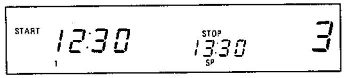


2 Enter the date using numeric keys ⑮.

- Invalid numbers will be rejected.
- To record a daily serial starting on the day of setting, press CURSOR "+" ㉗ without entering any date figure.
- To record a daily serial starting on a certain day, press DAILY (8) and enter the date.
- To record a weekly serial, press REPEAT (9) and enter the date.
- Both "daily" and "weekly" commands can be entered or cancelled by pressing the corresponding button any time in the date and time setting stages.

3 When the display changes to the next stage, key in the start time, stop time and channel in succession using numeric keys.

- To key in a one-digit number of hours or minutes, first press "0". Then press the relevant numeric key.
- For keying in channel numbers, refer to page 7.



4 Press SP/LP ⑲ to obtain the desired recording mode indication on the display.

- The SP or LP entry can be made anytime while in the Timer Set mode.

5 After making sure that the cassette is loaded, press TIMER ㉙.

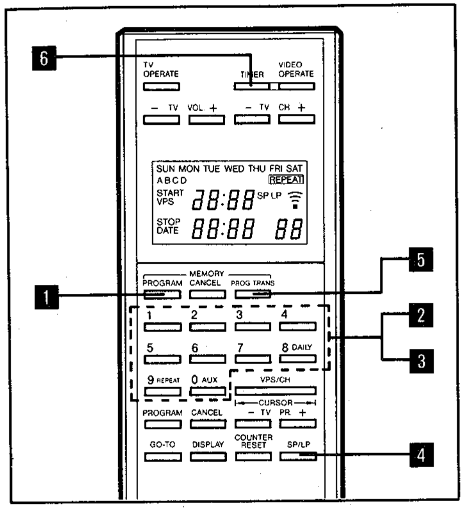
- The Timer Recording Standby mode will be engaged with the TIMER indicator and the preset programme number(s) illuminated and the power turned off.
- With no cassette loaded, the TIMER and "cassette loaded" indicators will continue blinking.
- A cassette whose safety tab has been removed will be rejected automatically.
- If a preset programme contains errors, that programme number will not be illuminated. Recheck the programmed data.

B. Direct Remote Programming

Following the procedures above, use the remote control's buttons instead of the recorder's with the remote control directed toward the recorder's REMOTE SENSOR window ❶.

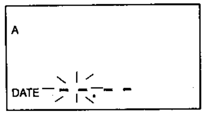
C. Independent Remote Programming

- The remote control incorporates 4 programme memories (A, B, C and D).
- The programmed data is held in memory even after it has been transferred to the recorder.



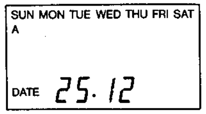
1 Press MEMORY PROGRAM ㊱.

- The LCD will be activated for programme memory "A".
- To advance to programmes B to D, press again.

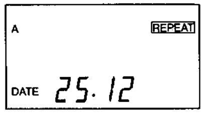


2 Enter the date using numeric keys ㊴.

- Setting for a daily or weekly serial is the same as described in "A. Local Programming".



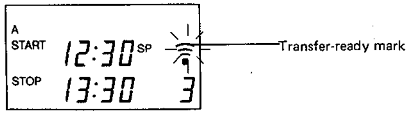
For daily serial setting



For weekly serial setting

3 When the display changes to the next stage, enter the start time, stop time and channel in succession.

- After the channel has been entered, the transfer-ready mark will appear and blink.



4 Press SP/LP ㊹ to obtain the desired recording mode indication on the display.

- The SP or LP entry can be made anytime while in the Timer Set mode.

5 Direct the remote control to the recorder's REMOTE SENSOR window ❶ and press PROG. TRANS ㊳.

- The programmed data will be loaded in one of the recorder's memories (1 – 8), the vacant one of the smallest programme number.
- If all programme memories are full, the recorder's clock will blink and transmission will not take place.

6 Press TIMER ㉛.

- Check to see that the TIMER indicator and other items on the recorder's FDP respond correctly. See page 13.

Setting the date, start and stop times, and channel

- It is not possible to set the date, start and stop times unless the date and clock have previously been set.
- Enter the data while the digits are blinking.
- Unless the start time has been properly set, stop time setting is not possible.
- The stop time can be set within 24 hours from the start time.
- Non-applicable numbers (such as January 32, February 30 for dates, 24 or larger for hours, 60 or larger for minutes and 49 or larger for channels) will be rejected when keyed in.

Cancelling the preset data

- The preset programmes can be cancelled. First engage the Timer Set mode for the programme number you wish to cancel and then press the CANCEL button ㉔ or ㊷.

Checking the programmed data

- Checking and re-programming can be performed anytime, even when the TIMER button has already been engaged.
- While recording is actually taking place according to one preset programme, all other preset programmes can be checked or re-programmed.
- To disengage the Timer Set mode, press the COUNTER/REMAIN/DATE button ㉑ (on the recorder) or the DISPLAY button ㊻ (on the remote control).

Timer recording operation

- When the preset start time is reached, recording starts.
- After timer recording, the power is switched off. If the tape end is reached during timer recording, the cassette is automatically ejected and the power is switched off.

How to use the CURSOR keys

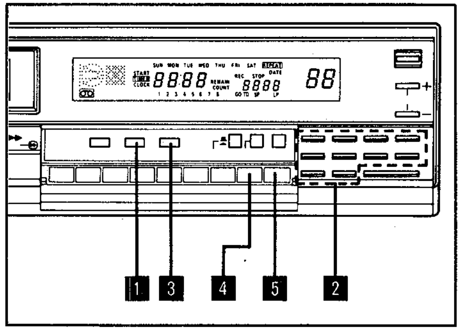
- If you press a wrong key and the flashing position has advanced, press "-" to return to the previous position for correction.
- Once all data have been programmed, you can reach any position for correction using "-" or "+". The flashing position is ready for re-entry.
- The cursor (flashing position) advances or returns in the following order.

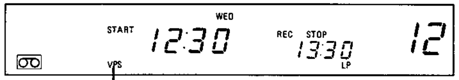
$\text{Date} \rightleftarrows \text{Start time} \rightleftarrows \text{Stop time} \rightleftarrows \text{Channel} \rightleftarrows$

(Pressing PROGRAM engages the check mode in which no position flashes and data correction is not possible. To correct the data, press either CURSOR key; "+" to move to "Date" or "-" to move to "Channel".)

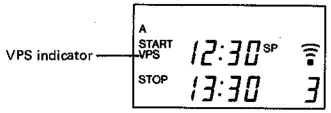
VPS RECORDING (Use the optional VU-V90E VPS Unit for VPS recording.)

VPS (Video Programme System) is a broadcast system employed by TV stations in certain areas. In this system, TV stations transmit different VPS codes for different TV programmes, which control the starting and stopping of the video recorder and have precedence over times preset in the timer for accurate recording of a particular programme from start to finish.





VPS indicator
Illuminated : VPS standby mode (in program mode)
: VPS broadcast received
Blinking : VPS recording progress



1. Press PROGRAM ⑱.
2. Set the date, start time, stop time and channel in the same way as for timer programming.
3. Select SP or LP ⑲.
4. Press VPS ㉘.
   - All timer data will be converted to VPS codes and stored in memory.
5. Press TIMER ㉙.
   - The recorder will enter the VPS standby mode at 20:00 on the day previous to the preset day and remain engaged until 3:59 on the following day, if the intended programme has not yet been broadcast.
   - When a VPS code corresponding to the intended TV programme is detected during the VPS standby mode, recording will start. When the VPS code changes to another, recording will stop.
   - When an interruption code is detected during VPS recording, the VPS standby mode is engaged and recording restarts when the regular VPS code is restored.

Notes:

- When programming the remote control's memory, the VPS indicator will appear on the LCD when VPS command is entered. However, transfer of this VPS command has no effect unless a VPS adapter is connected to the HR-D230E.
- If no VPS code is detected from that station or a system status code which cancels VPS recording is detected, ordinary timer recording will be engaged.
- Operation at the end of VPS recording is the same as with ordinary timer recording.

RECORDING FROM AN EXTERNAL SOURCE

By connecting an external video source (such as a VideoMovie camera-recorder, 2nd video recorder, video camera, etc.) to the AUDIO/VIDEO socket, recording and/or editing are possible.

- For connection of these units, an appropriate cable is necessary.
- For connection of a video camera, a camera adapter is also necessary. Connect the camera adapter's PAUSE terminal to the recorder's PAUSE connector (61), then you can control taping start/stop with the camera's start/stop switch. For proper connection of a camera, consult a JVC dealer.

1. Turn the power on for all connected equipment.
2. Adjust the TV receiver to your video channel.
3. Load a cassette.
4. Press either TV PR. button ⑤ or the numeric key 0/AUX ⑮ to obtain "AU" in the channel display.
5. Set SP/LP ⑲ as required.
6. Operate the source equipment properly.
7. Press REC ⑩ and PLAY ⑨ simultaneously.
   - When recording with a camera, press REC and PAUSE/STILL to enter the Recording Standby mode, then control taping start/stop with the camera's start/stop switch.
8. To stop recording temporarily, press PAUSE/STILL ⑫.
9. To end recording, press STOP ⑧.

Note:

- For the operation of the source equipment, refer to the instruction manual of the relevant machine.

IN CASE OF DIFFICULTY

What may initially appear to be trouble is not always a real problem. Make sure first . . . .

Symptoms	Check points
No power is applied to the recorder.	• Is the power cord disconnected? Connect it.
Playback picture does not appear while the tape is running.	• Is the TV receiver's channel selector set to the correct video channel? Set to the RF converter channel.
Tape does not run in the Record mode.	• Is the PAUSE/STILL button pressed? Press PLAY to release.
REC button cannot be engaged.	• Is the cassette improperly loaded? Load it properly. • Is the safety tab broken? Reseal the slot.
Tape stops in the Rewind or Fast Forward mode.	• Is the COUNTER MEMORY button set to ON? Set to OFF.
Tape will not rewind.	• Is the tape already rewound to the end?
Noisy playback picture.	• Adjust with the TRACKING control.
Pressing PAUSE/STILL during playback brings a still picture (in a frame-by-frame manner) with noise bars.	• Noise bars can be eliminated by pressing the PAUSE/STILL button a few more times.

This recorder contains microcomputers. External electronic noise or interference could cause malfunctioning. In such cases, switch the power off and unplug the power cord. Then plug it in again and check the functions.

HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV programme received is clear. This does not mean that the recorded programme has been erased.
- Dirt accumulated on the video heads after long periods of use causes such problems. In this case, head cleaning requiring highly technical care is necessary.

For head cleaning, consult the nearest JVC dealer.

INSTRUCTIONS:
VIDEO CASSETTE RECORDER

For reference, the text of the Instruction booklet for this model is reproduced in the following pages.

Numbering of the pages also corresponds with that of the booklet.

The Instructions shown pertain specifically to the Model HR-D230E. For detailed descriptions, be sure to consult the Instruction booklets of the other models.

Main differing points with respect to other models in this series (with suffixes E, EG and EK) are also included.

The following table lists the principal differing points among the models (suffixes E, EG and EK) in this series.

Item \ **Model**		**E**	**EG**	**EK**
Power requirement		220 V∿, 50/60 Hz	←	240 V∿, 50/60 Hz
TV-Tuner	VHF BAND	47–89 MHz 104–300 MHz 302–470 MHz	←	No
	UHF BAND	470–862 MHz	←	21–69 (channels)
	Channel preset capacity	48	48	32
V P S Decoder		No (Provided VPS connector)	Yes (built-in)	No

NOTE: ← : Same as model at left

SECTION 1
MECHANISM ADJUSTMENT

1.1 GENERAL

1.1.1 Precautions

IMPORTANT:

1. Disconnect unit from power before removing or soldering components.
2. When removing a fastener (screw, washer, etc.), be careful not to drop it into the mechanism. If a fastener should be dropped, be sure to retrieve it.
3. The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require readjustment.
4. When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the tape guides and rotary video head drum.)
5. For service procedures that call for operation of the set when the cassette housing is separated from the main-deck, perform as below.

1) Set a sheet of insulated material on the right of the chassis.
2) Remove the cassette housing from the main-deck and place it on the insulated sheet, but do not disconnect the connector from the VIDEO BOARD.
3) Insert a cassette into the cassette housing. The housing mechanism functions to retract the cassette.
4) Disable the photo transistor sensor (END SENSOR) on the main-deck by applying an opaque cover.
5) The desired modes can be obtained by using the operation switches.

1.1.2 Required test equipment, fixtures and tools

For proper mechanical adjustment, the following test equipment, fixtures and tools are strongly recommended. Without them, a long trial-and-error period would be necessary, resulting in possible damage. In addition, general-purpose tools are required.

1. Test equipment required:

Color television or monitor
Oscilloscope: Wide-band, dual trace, triggered, delayed sweep
Recording tape
Alignment tapes

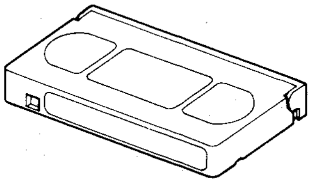
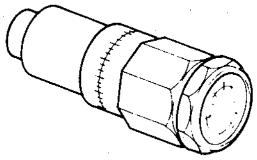
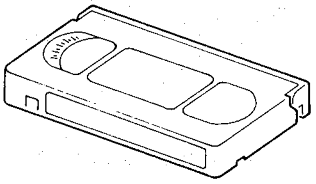
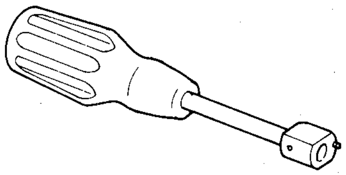
JVC alignment tape MH-2, MH-2L 	Torque gauge assembly PUJ48075-2 (Torquemeter : 600ATG Torquemeterhead : PUJ48016-2) 	Back tension cassette gauge PUJ48076-2 
A/CTL head position tool PUJ47351-2 		

Table 1-1-1 Fixtures and tools

1.1.3 Disassembly (external covers)

1. Top cover
1) Take out five screws from the right, left and rear sides of the set.
2) Tilt up the rear end of the top cover, then remove the top cover.

2. Bottom cover
1) Take out five screws from the bottom side of the set.
2) Set free the bottom cover from six claws of the chassis in order to remove the bottom cover.

3. Front panel assembly
1) Remove the top cover.
2) Bend three upper hooks of the front panel assembly upward from their chassis retainers in order to disengage the hooks from the chassis.
3) Disengage three lower hooks of the front panel assembly from the bottom side of the set in order to remove the front panel assembly from the chassis.
4) Reassemble the front panel assembly so that earth plate on the rear of front panel assembly becomes outer side of the cassette housing assembly. (Refer to Fig. 1-1-2)

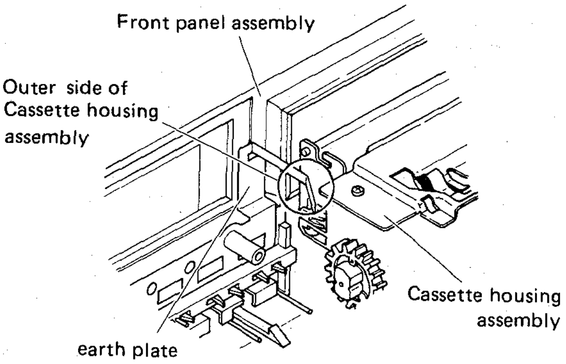

Front panel assembly
Outer side of Cassette housing assembly
Cassette housing assembly
earth plate

Fig. 1-1-2

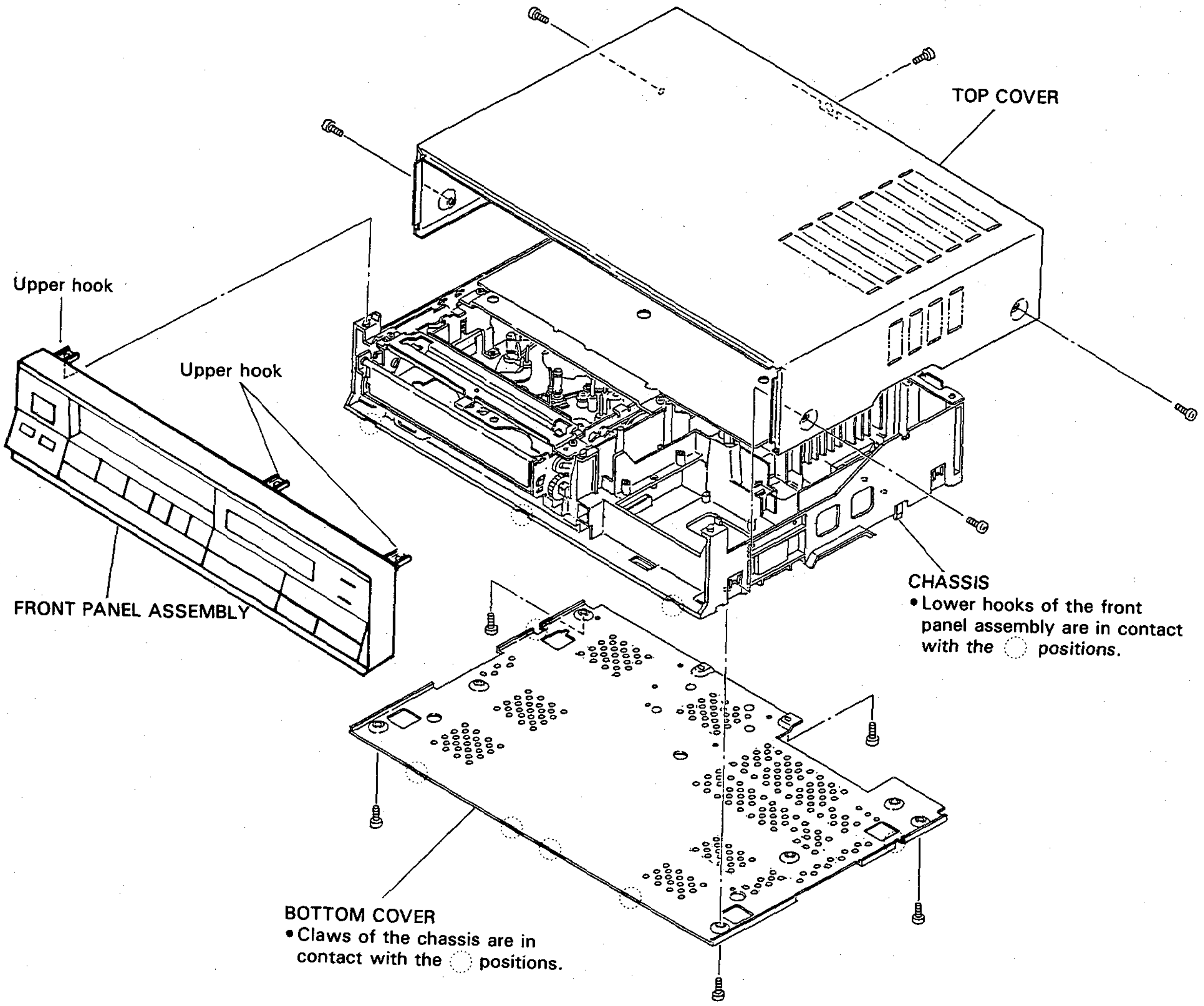

TOP COVER
Upper hook
Upper hook
FRONT PANEL ASSEMBLY
CHASSIS
• Lower hooks of the front panel assembly are in contact with the ⬚ positions.
BOTTOM COVER
• Claws of the chassis are in contact with the ⬚ positions.

Fig. 1-1-1 Removal of external covers

1.1.4 Layout of main parts

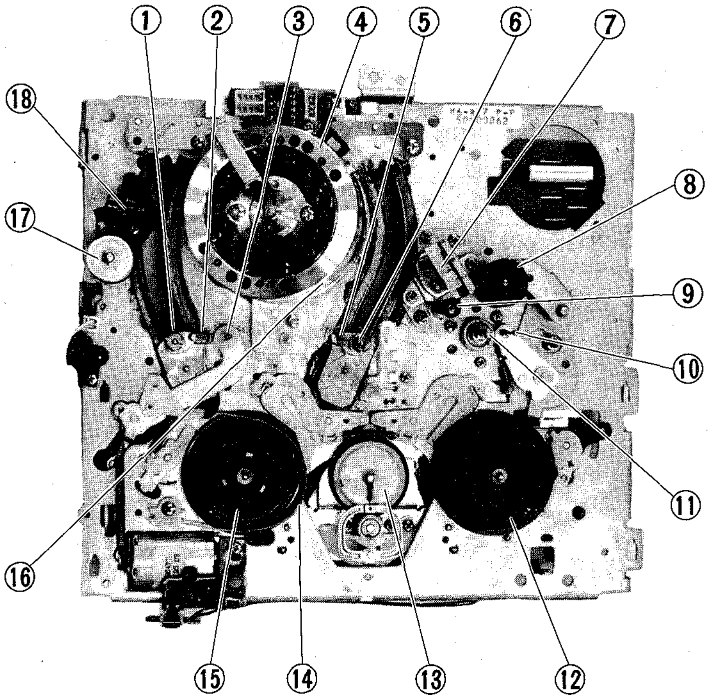


Fig. 1-1-2 Top view of main-deck

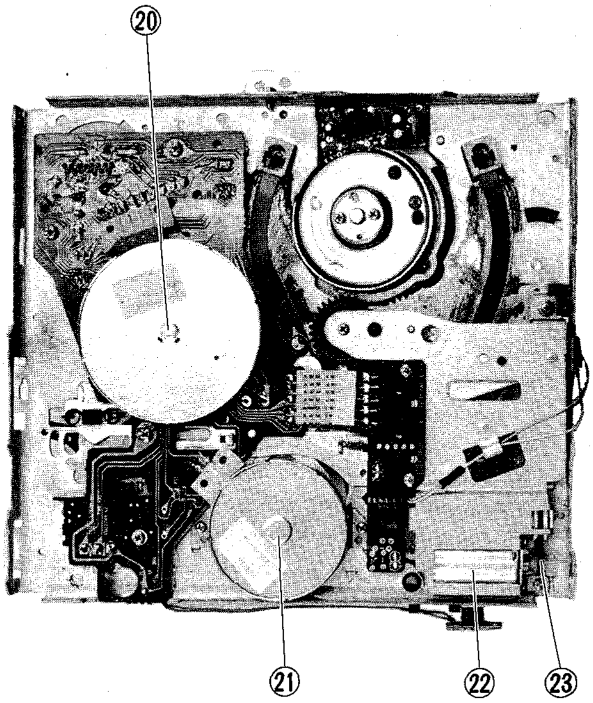


Fig. 1-1-3 Bottom view of main-deck

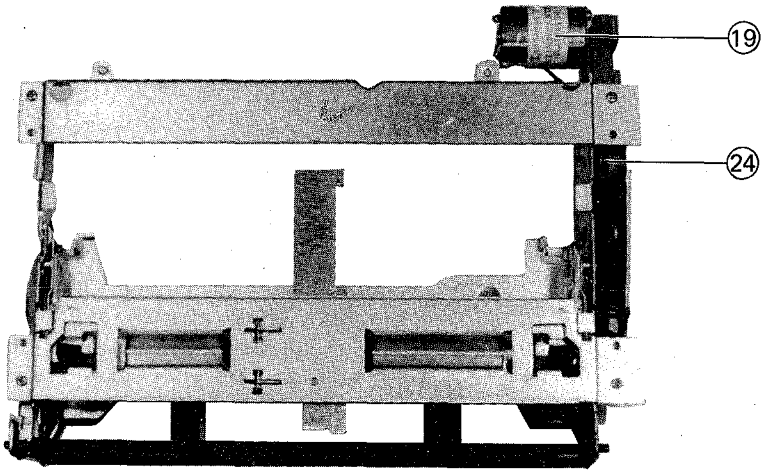


Fig. 1-1-4 Cassette housing

1.	Supply guide roller	9.	Take-up guide pole	17.	Impedance roller
2.	Supply slant pole	10.	Guide arm	18.	Full erase head
3.	Tension pole	11.	Capstan	19.	Cassette motor
4.	Upper drum	12.	Take-up reel disk	20.	Capstan motor
5.	Take-up slant pole	13.	Reel idler	21.	Reel motor
6.	Take-up guide roller	14.	Tension band	22.	Mode motor
7.	A/C head	15.	Supply reel disk	23.	Mode belt
8.	Pinch roller	16.	Lower drum	24.	Cassette belt

1.2 MAIN ASSEMBLY REPLACEMENT

1.2.1 Upper drum assembly

Notes: When handling and installing the upper drum assembly, avoid directly touching the head tips on the upper drum assembly.

For cleaning the head tips, push and hold a lint-free cloth or chamois dampened with alcohol to the upper drum assembly by the fingers, then turn the upper drum assembly clockwise. Do not clean the upper drum assembly with a vertical stroke.

1. Removal
1) Take out a screw and remove the brush assembly from the drum assembly.
2) Unsolder all soldered portions on the DRUM BOARD. Remove excess solder, then remove the DRUM BOARD from the upper drum assembly.

   Note: Soldered portion can be easily removed by removing solder with sucker or wick.
3) Take out two screws and remove the upper drum assembly upwards.

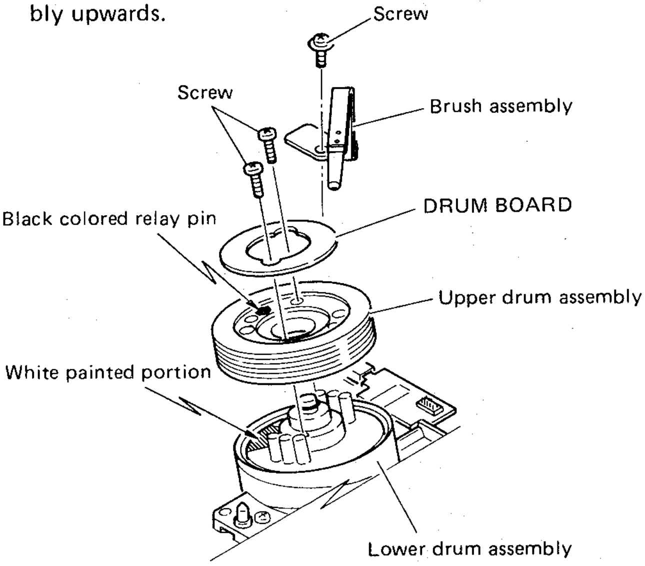


Fig. 1-2-1 Upper drum assembly

2. Installation
1) Install a new upper drum assembly so that the black-colored relay pin of the upper drum assembly overlies the white painted portion of the lower drum assembly, as shown in Fig. 1-2-1.
2) Tighten two screws in a balanced manner.
3) Set the DRUM BOARD on the upper drum assembly, then resolder it.
4) Clean the drum unit (particularly clean the upper drum assembly).
5) Mount the brush assembly on the original position, then tighten a screw to fix the brush assembly.

3. Confirmation and adjustment
1) Perform the interchangeability confirmation. Refer to section 1.6.
2) Perform the PB switching point adjustment of the Servo (VIDEO BOARD) circuit. Refer to section 2.2.1.

1.2.2 A/C head (Audio/control head)

1. Removal
1) Disconnect connectors from the A/C HEAD BOARD.
2) Take out two screws, then remove the A/C head and the head base together.
3) Unsolder and separate the A/C HEAD BOARD from the A/C head.
4) Take out a screw and remove the shield cap from the A/C head.
5) Take out three screws and separate the A/C head from the head base. Use care regarding springs. Do not lose them.

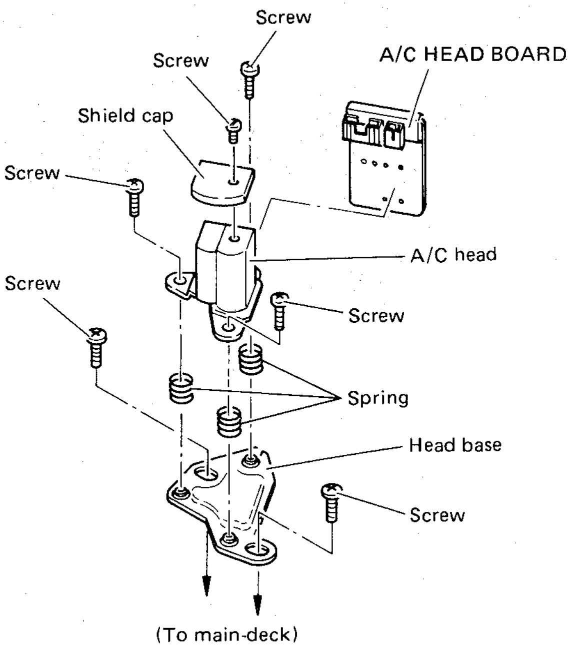


Fig. 1-2-2 A/C head

2. Installation
1) Mount a new A/C head and other peripheral parts on the main-deck by reversing the removal procedure.
2) Before installing the A/C head on the main-deck, perform rough-adjustment of A/C head height as shown in Fig. 1-2-3.

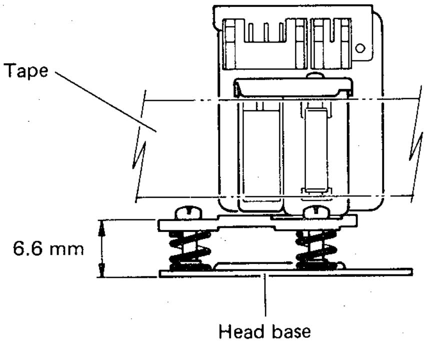


Fig. 1-2-3 A/C head height

3. Confirmation and adjustment
1) Use a recording tape and confirm correct tape transport operation, then perform interchangeability adjustment. Refer to sections 1.5 and 1.6.
2) Perform overall confirmation of the Audio circuit. Refer to section 2.4.

1.2.3 Tension band assembly

1. Removal
1) Take out a screw, then pry the A portion of the tension band assembly upwards to separate it from the tension arm assembly.

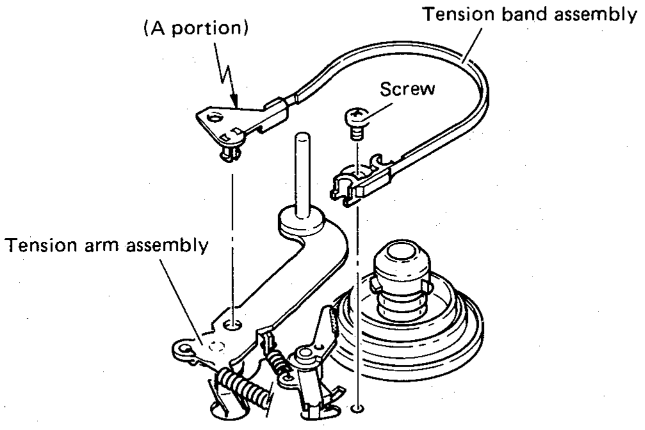

(A portion)
Tension band assembly
Screw
Tension arm assembly

Fig. 1-2-4 Tension band assembly

2. Installation
1) Install a new tension band assembly by reversing the removal procedure.

3. Confirmation and adjustment
1) Perform tension pole position adjustment. Refer to section 1.4.1.

1.3 ASSEMBLY PROCEDURE OF MECHANISM

The mechanism of this model is mostly engaged to the mechanism control circuit, through the mode select switch. Therefore, the relation between the mode select switch and the control arm decides all mechanical movement of the mechanical parts such as levers, gears, rollers and so on. If these parts are not properly positioned, the unit will be unloaded or compulsorily stopped. This will result in damage of mechanical or electrical parts.

1.3.1 Loading arm assembly

Loading arm assembly consists of loading gear, torsion spring and loading arm.

1. Set up the loading arm assembly correctly as shown in Fig. 1-3-1.

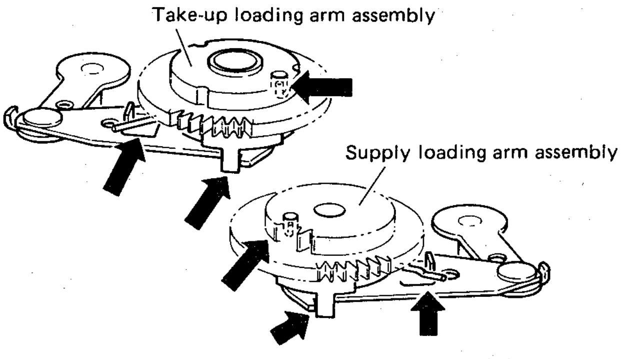

Take-up loading arm assembly
Supply loading arm assembly

Fig. 1-3-1 Loading arm assembly (1)

2. Install the take-up loading arm assembly and the supply loading arm assembly so that the holes on the loading gears face each other, as shown in Fig. 1-3-2. Do not move the loading arm assemblies from this position for the next step.

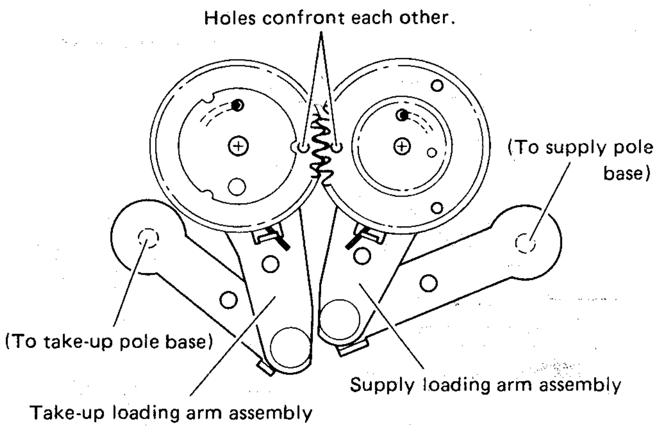

Holes confront each other.
(To supply pole base)
(To take-up pole base)
Supply loading arm assembly
Take-up loading arm assembly

Fig. 1-3-2 Loading arm assembly (2)

1.3.2 Control cam

1. Assemble the second gear and the control cam so that the stud of the control cam sets into the hole of the second gear (A portion in figure).
2. Mount the above assembly (control cam and second gear) on the cam bracket assembly to put it in the relations as shown in figure.

Notes: Three holes at B portion are severally on the control cam, on the arm gear assembly and on the cam bracket assembly.
Three holes at C portion are severally on the control cam, on the half loading cam and on the cam bracket assembly.

3. Do not turn the control cam from this position for the next step.

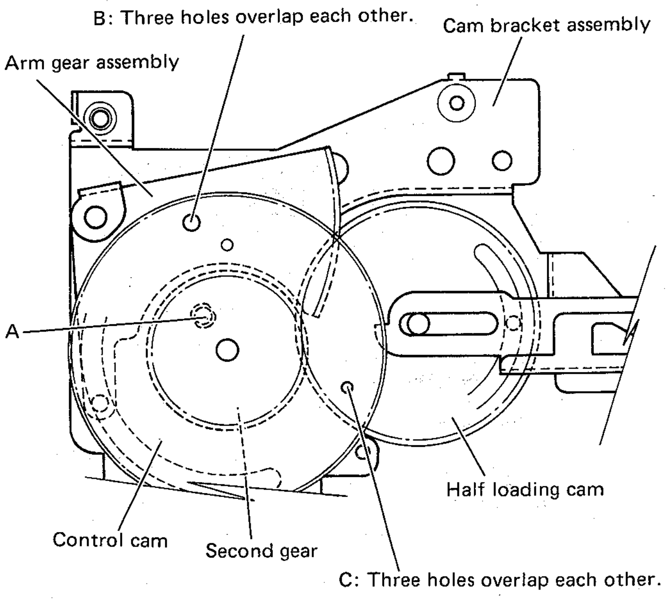

B: Three holes overlap each other.
Cam bracket assembly
Arm gear assembly
A
Half loading cam
Control cam
Second gear
C: Three holes overlap each other.

Fig. 1-3-3 Control cam

1.3.3 Cam bracket assembly

1. Push and hold the plate assembly so that the hole of the plate assembly overlaps the hole of the main-deck, as shown in Fig. 1-3-4.
2. Then mount the cam bracket assembly.

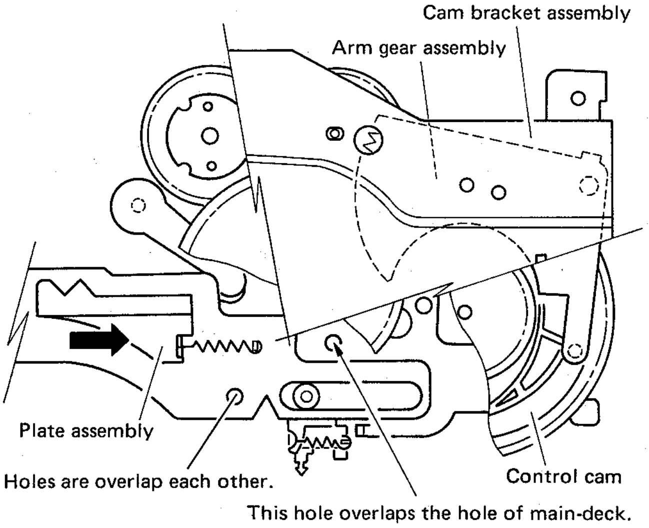

Cam bracket assembly
Arm gear assembly
Plate assembly
Holes are overlap each other.
Control cam
This hole overlaps the hole of main-deck.

Fig. 1-3-4 Cam bracket assembly

Note: In order to overlap the holes turn the control cam fully counter clockwise by turning the mode motor with a finger.

1.3.4 Mode select switch

1. When the hole of the plate assembly overlaps the hole of main-desk, refer to Fig.1-3-4, confirm that the V-cut of the slider section just overlaps the V-cut of the outer section of the mode select switch.
2. If a difference of more than 0.5 mm is noticed, adjust the mode select switch to the correct position, after unsoldering and loosening the screw.

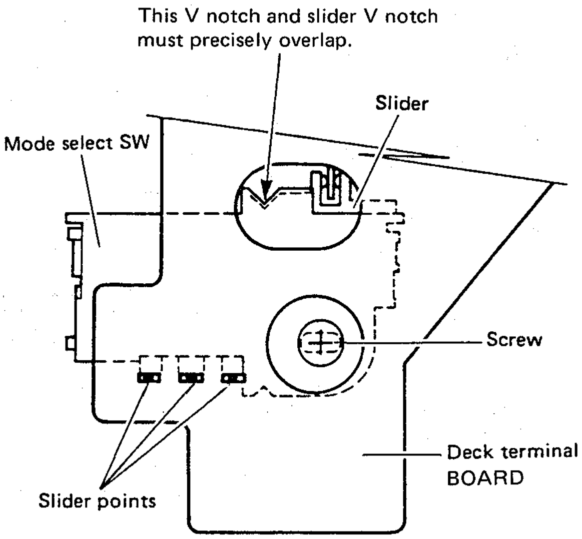

This V notch and slider V notch must precisely overlap.
Slider
Mode select SW
Screw
Deck terminal BOARD
Slider points

Fig. 1-3-5 Mode select switch

1.4 CONFIRMATION AND ADJUSTMENT

1.4.1 Tension pole position adjustment

1. Without loading a tape, set for the Play mode.
2. Loosen screw a little bit, then adjust the tension band holder so that the distance, shown in Fig. 1-4-1, becomes zero (0 mm).
3. Tighten screw to fix the tension band holder.

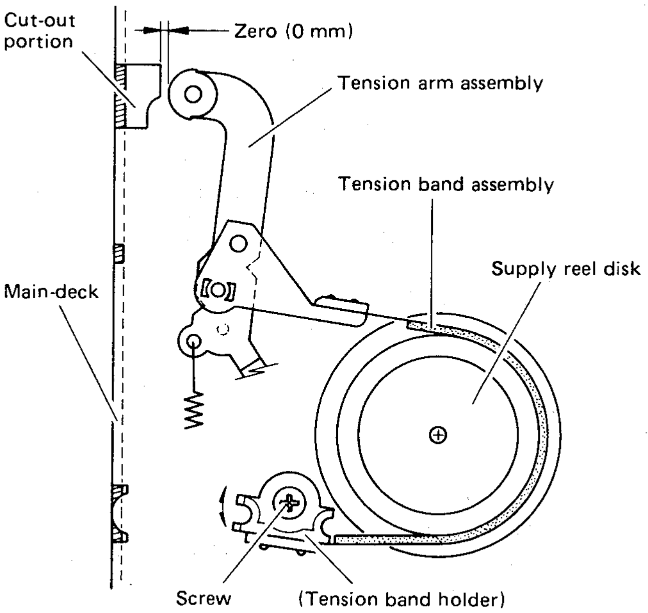

Cut-out portion
Zero (0 mm)
Tension arm assembly
Tension band assembly
Supply reel disk
Main-deck
Screw
(Tension band holder)

Fig. 1-4-1 Tension pole position

Note: By this adjustment, back tension is within normal specification, in spite of parts tolerances.

4. Use the back tension cassette gauge and set for the Play mode.
5. Confirm that the indication is between 25 – 75.

1.4.2 Take-up torque confirmation

1. Set the Play mode without the cassette housing assembly.
2. Set the torque gauge on the take-up reel disk.
3. The torque gauge consists of upper and lower sections connected by a spring mechanism. Relax the grip on the torque gauge so that the indicator needle and scale rotate at equal speed, then read the indication. The correct value is between 45 – 155.
4. If necessary, replace the take-up and supply clutches.

1.5 TAPE TRANSPORT SYSTEM CONFIRMATION AND ADJUSTMENT

Once adjusted to the complete condition, readjustment of the tape transport system is not necessary, except when the parts that compose the tape transport system are replaced due to troubles by long usage or unexpected accidents.

1.5.1 Tape transport system adjustment

1. Guide roller

   To get the FM envelope into ideal shape for interchangeability, the height adjustment of the guide roller is needed.

   Before turning the guide roller, slightly loosen the setscrew located under the guide roller. For loosening the setscrew, use the hex key (1.25 mm).

   Note: Loosen the setscrew enough to allow the guide roller to be turned. If excessively loose, tape motion may turn the guide roller inadvertently.

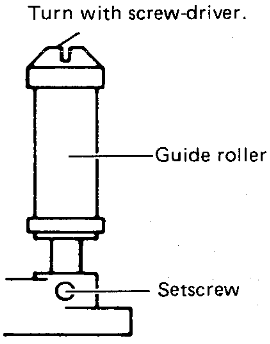

Turn with screw-driver.
Guide roller
Setscrew

Fig. 1-5-1 Guide roller

2. Impedance roller

   Normally, do not adjust the height of the impedance roller. Only when the defects of tape travel are noted at the impedance roller, after complete adjustment for interchangeability, adjust the height of impedance roller to obtain smooth tape travel. For adjustment of impedance roller height, use the nut-driver (5.5 mm).

   Note: Do not lower the impedance roller excessively to avoid the defects of tape travel. Tape must be along the lower flange located under the impedance roller.

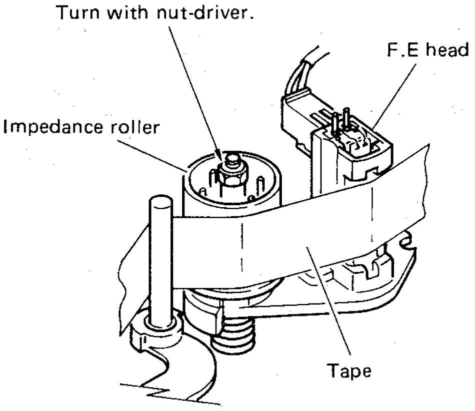

Turn with nut-driver.
F.E head
Impedance roller
Tape

Fig. 1-5-2 Impedance roller

3. A/C head (audio/control head)

   When defects of tape travel are noted at the take-up guide pole, adjust the inclination of A/C head to obtain smooth tape travel.

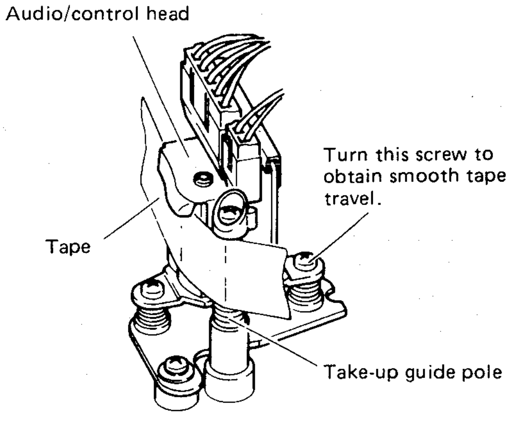

Audio/control head
Turn this screw to obtain smooth tape travel.
Tape
Take-up guide pole

Fig. 1-5-3 A/C head

1.6 INTERCHANGEABILITY CONFIRMATION AND ADJUSTMENT

Before using an alignment tape, use a recording tape and confirm correct tape transport operation.
For the FM envelope output, connect an oscilloscope to TP106 of the VIDEO BOARD. For audio output, connect to the AUDIO OUT terminal, and trigger the oscilloscope externally with the signal from TP11 of the SERVO BOARD. Use only the stairstep segment of the alignment tape, do not use another segment for interchangeability.

1.6.1 FM envelope confirmation and adjustment

1. Push the TRACKING +/– buttons to obtain the maximum FM envelope output corresponding to (a) level in Fig. 1-6-1. Observe the FM envelope, read the maximum level (a) and the minimum levels (b), (c) and (d).
   Confirm that:

$$\frac{b}{a} \geq 0.7\ ,\ \frac{c}{a} \geq 0.5 \text{ and } \frac{d}{a} \geq 0.5$$

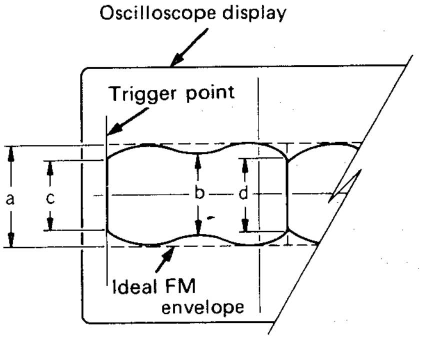


Fig. 1-6-1 FM envelope

2. If defects are noted, following adjustments are required.
1) Observe the oscilloscope display and push the TRACKING +/– buttons to vary the FM output from maximum to minimum.
2) If the variation is not parallel at the rising portion (drum entrance) of the FM envelope, turn the supply guide roller so that the rising portion of the envelope becomes nearly flat, as shown in Fig. 1-6-2.

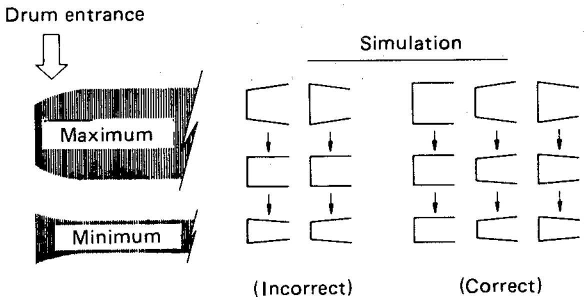


Fig. 1-6-2 Drum entrance

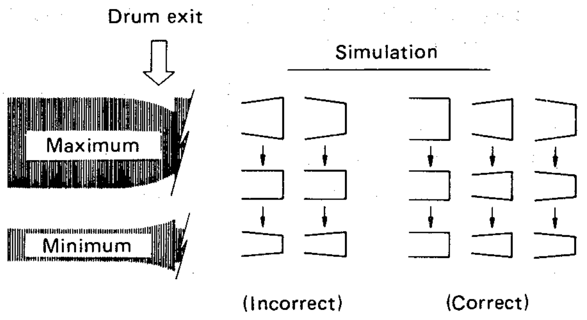


Fig. 1-6-3 Drum exit

3) In the same manner as for the rising portion, turn the take-up guide roller to adjust the falling portion (drum exit) of the FM envelope. See Fig. 1-6-3.
4) In addition to observing the envelope, confirm absence of tape curling or wrinkling at the impedance roller and take-up guide pole. If it occurs at the impedance roller, adjust the impedance roller height. If it occurs at the take-up guide pole, adjust the A/C head inclination.
5) Vary the FM envelope output level and perform fine adjustments of the guide rollers.

1.6.2 A/C head height and azimuth adjustments

Incorrect A/C head height can impair audio signal-to-noise ratio when playing back a pre-recorded tape.

1. For A/C head inclination, adjust screw (A) so that small tape wrinkles are not produced at the take-up guide pole. Turn screw (A) clockwise so that the tape wrinkles are apparent with the lower flange of the take-up guide pole, then turn screw (A) counter-clockwise so that the wrinkles smooth out.
2. Adjust azimuth with screw (B).
   Turn screw (B) to obtain maximum audio output.
3. For A/C head height, turn screws (A), (B) and (C) in succession by small and equal increments at a time and adjust for maximum audio output level.

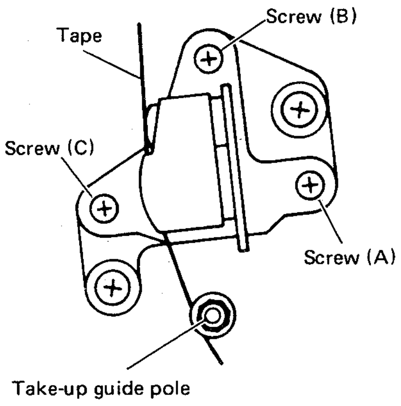


Fig. 1-6-4 A/C head

1.6.3 Control head phase adjustment

1. Set Tracking to Pre-Set Position by pushing both + button and – button at the same time.
2. Loosen screws (D) and (E) a little bit, then cover screw (D) with the A/CTL head position tool and set the pin of the tool into the hole next to screw (D).
3. Turn the tool counter-clockwise to shift the A/C head fully in the direction of the capstan, and then gradually turn the tool clockwise and observe the FM envelope output.
4. Set the A/C head at the point of the first output peak.

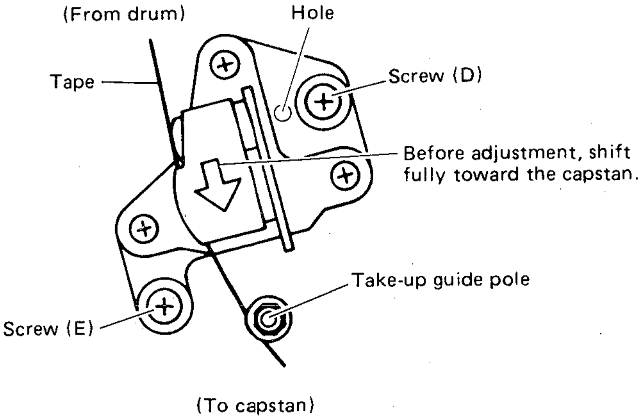


Fig. 1-6-5 Control head phase

5. Replace alignment tape MH-2L with MH-2, playback the stairstep segment of the alignment tape MH-2L.
6. Observe the oscilloscope display and push the TRACKING +/- buttons to vary the FM output level, confirm that the FM output peak is obtained at Tracking pre-set position.
7. If the FM output peak is not obtained at Tracking pre-set position, shift the A/C head at the FM output peak nearest this position.

1.6.4 Setscrew tightening

1. After confirming absence of tape wrinkling and other transport irregularities, tighten the setscrews located under the guide rollers while in the Stop mode.
   Note: Since the guide rollers are easily moved, use care when tightening.
2. Again perform the FM envelope confirmation.

1.6.5 Final confirmation

1. Supply a video signal and perform recording, then play back.
   Confirm that the FM envelope satisfies the specifications during playback of alignment tape MH-2.
2. Perform the PB switching point adjustment of the Servo circuit. Refer to section 2.2.1.
3. Perform the audio PB level adjustment of the Audio circuit. Refer to section 2.4.2.
4. Perform overall confirmation of the Video circuit. Refer to section 2.3.

SECTION 2
ELECTRICAL ADJUSTMENTS

2.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts.
It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

2.1.1 Required test equipment

1. Color television or monitor
2. Oscilloscope: wide-band, dual-trace, triggered delayed sweep
3. Frequency counter
4. Audio oscillator
5. Audio voltmeter
6. Digital voltmeter
7. Signal generator: RF/IF sweep/marker
8. Signal generator: PAL color bar
9. Recording tape
10. Alignment tapes: (MH-2, MH-2L)
11. LP adjust board fixture (PUJ61839)
12. REG EXT board Ass'y (PUJ37697B)
13. Board extender (PUJ96003P)

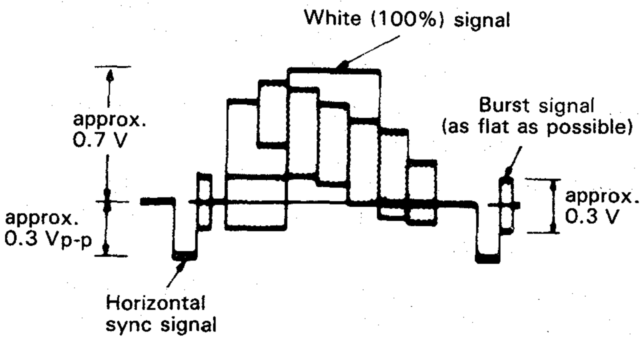

White (100%) signal
approx.
0.7 V
Burst signal
(as flat as possible)
approx.
0.3 V
approx.
0.3 Vp-p
Horizontal
sync signal

Fig. 2-1-1 Color bar signal of pattern generator

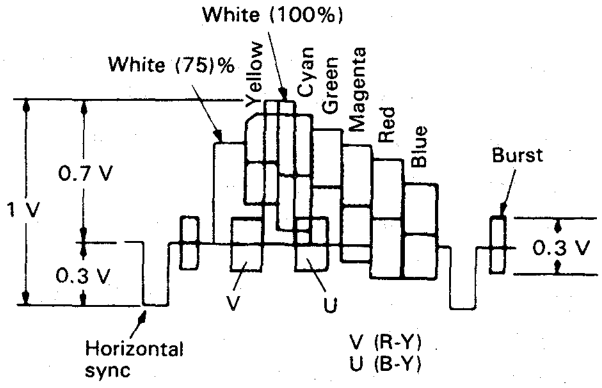

White (100%)
White (75)%
Yellow
Cyan
Green
Magenta
Red
Blue
Burst
0.7 V
1 V
0.3 V
0.3 V
V
U
Horizontal
sync
V (R-Y)
U (B-Y)

Fig. 2-1-2 Color bar signal waveform

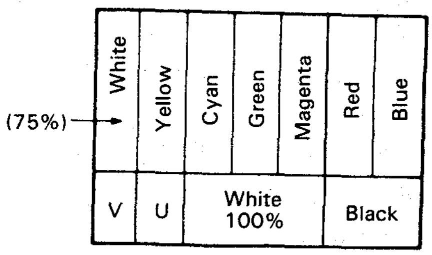

(75%)
White
Yellow
Cyan
Green
Magenta
Red
Blue
V
U
White
100%
Black

Fig. 2-1-3 Color bar pattern

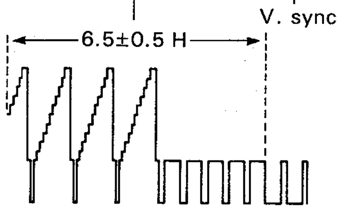
2.1.2 Check and adjustment steps

The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No.	Checks and adjustments are numbered in the recommended sequence in which they are to be performed.
Item	Name assigned to the particular check and adjustment step.
Check Point	Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.
Adjustment Parts	Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (–) indicates check only.
Signal & Mode	• Input signal required to perform adjustment. Dash (–) indicates that special signal is not required. • Equipment operating mode at time of check or adjustment.
Description	This column provides an explanation of the step, notes, adjustment values.
Color bar	Color bar signal as video input.
Stairstep	Stairstep signal as video input.
1 kHz	Supply a 1 kHz sinewave as audio input signal.
MH-2 Color bar	Play color bar segment of MH-2 alignment tape.
MH-2 Stairstep	Play stairstep segment of MH-2 alignment tape.
MH-2 1 kHz	Play 1 kHz audio signal segment of MH-2 alignment tape.
MH-2 RF sweep	Play RF sweep segment of MH-2 alignment tape.
MH-2L Color bar	Play color bar segment of MH-2L alignment tape.
MH-2L Stairstep	Play stairstep segment of MH-2L alignment tape.
Stop	Power on and machine in Stop mode.
REC	Recording mode
PB	Playback mode
REC ↓ (another mode)	Use blank tape, record, then play back in the mode specified.
Search	Search (FWDS and REVS) playback mode.
Slow	Slow motion playback mode.
Still	Playback then Pause.
A DUB	Audio dubbing mode.

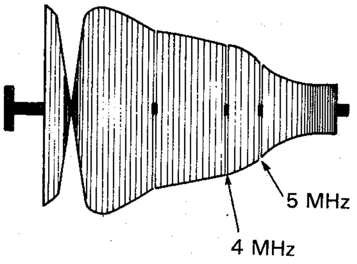
2.2 SERVO CIRCUIT (08 SERVO board)

Note: Unless otherwise specified, test points and variable resistors are located on the SERVO board.
Before this adjustment "Control head phase adjustment" must be completed.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	PB Switching Point	CN102 pin 1	R79 (SP PB SW POINT)	• PB • MH-2 Stairstep • Trigger slope (−) • SP mode	1. Connect an oscilloscope to CN102 pin 1 MAIN board. 2. Play back the stairstep segment of MH-2 alignment tape. 3. Trigger the oscilloscope externally (— slope) with the signal from TP11 SERVO board (DRUM FF). 4. Adjust R79 to position the trigger point 6.5 ±0.5 H from V. sync.
		 **Fig. 2-2-1**			
		TP401 or Q106-b	R35 (LP PB SW POINT)	• PB • MH-2L Stairstep • Trigger slope (−) • LP mode	5. Perform adjustment in the same manner as SP mode. 6. Connect an oscilloscope to TP401 or Q106-b. Play back the stairstep segment of MH-2L alignment tape. 7. Adjust R35 to position the trigger point 6.5±0.5 H from V. Sync.
2	V. Pulse Position	MONITOR	R1 06 TERMINAL board	• Still • REC then PB • Color bar • SP mode	1. Record the color bar signal, then playback. 2. In the Still mode, observe the monitor and adjust R1 (rear panel) for the minimum vertical jitter.

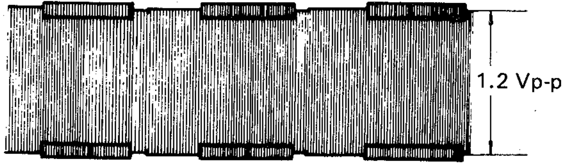
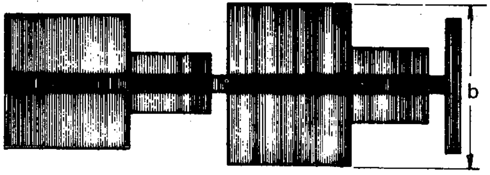
2.3 PRE/REC CIRCUIT (43 PRE/REC board)

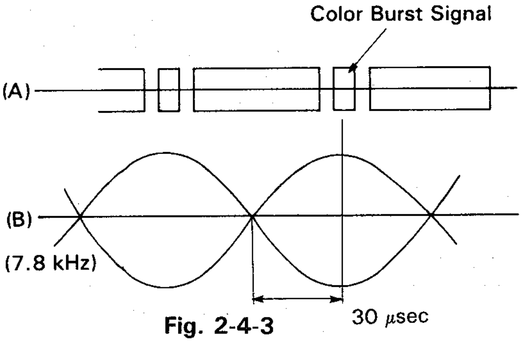
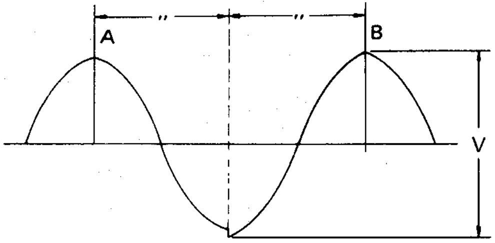
Note: Unless otherwise specified, test points and variable resistors are located on the PRE/REC board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Video Heads Resonance & Quality Factor	TP5	R2, CH1 C7 R1, CH2 C5	• SP mode • MH-2 RF Sweep • PB	1. Connect an oscilloscope to TP5 and trigger the oscilloscope externally with the signal from TP11 of the SERVO board. Use (−) trigger for CH1 and (+) for CH2. 2. Play back RF sweep segment of MH-2 alignment tape. Adjust the TRACKING control (R401) of the OPERATION board for maximum level of RF Sweep. 3. Turn R1 and R2 so as not to damp. Adjust C5 and C7 to set the CH1 and CH2 resonance points to 5 MHz. Adjust R1 to set the 5 MHz level 1 dB smaller than the 4 MHz level. 4. In the same manner, adjust R1 for CH2. If the CH1 and CH2 levels differ, adjust the higher level to match the lower with R1 and R2.
		 **Fig. 2-3-1**			
		TP5	R3, CH1 C13 R4, CH2 C15	• LP mode • MH-2 RF Sweep • PB	5. Connect the LP ADJUST BOARD Fixture (PUJ61839) to CN2 of the SERVO board. Perform adjustment in the same manner as SP mode CH1 and CH2. At TP5, adjust C13 and C15 resonance points to 5 MHz. Adjust R3 and R4 to set the 5 MHz level 1 dB smaller than the 4 MHz level. **Note:** Connect an oscilloscope ground to the shield cover.

2.4 VIDEO CIRCUIT (0 3 MAIN board)

Note: Unless otherwise specified, test points and variable resistors are located on the MAIN board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	REC FM Level  Fig. 2-4-1	TP3 (REC FM) 4 3 Pre Rec Amp	R119 (REC FM ADJ)	• Color bar • REC • LP mode	1. Supply a color bar input signal. 2. Connect an oscilloscope to TP3 on PRE/REC board. 3. Adjust R119 so that the pedestal level of the vertical blanking component becomes 1.2 Vp-p. **Note:** Connect an oscilloscope ground to the shield cover.
2	VXO	TP306 (FSC)	R328 VXO	• PB • MH-2 Color bar • SP mode	1. Connect a frequency counter to TP306. 2. Playback the color bar segment of MH-2 alignment tape. 3. Adjust R328 for 4.433619 MHz ±50 Hz.
3	SP REC Color Level  Fig. 2-4-2	TP304	R322	• PB • SP mode • REC then PB • Color bar	1. Connect an oscilloscope to TP304, playback a color bar segment of the MH-2 and observe color signal level. 2. Adjust the Tracking control (R401) of the OPERATION board for maximum level of the color waveform and make a note of the higher color level. 3. Set the Tracking control (R401) to the center click position. 4. Record the color bar signal then playback. Before recording, adjust R322 so that the higher level channel becomes 95 to 105% of the noted level during playback. At this time, confirm that the channel difference is with in 3 dB.
4	LP REC Color	TP304	R438	• PB • LP mode • REC then PB • Color bar	1. Connect the LP ADJUST BOARD Fixture (PUJ61839) to CN2 of the SERVO board. 2. Perform adjustment in the same manner as SP mode. 3. Remove the fixture. Record the color bar signal, then playback. Before recording, adjust R438 so that the higher level channel becomes 85 to 95% of the noted level during playback. At this time, confirm that the channel difference is within 3 dB as shown in Fig. 2-4-2.
5	Delayed Color Level	TP405	R401	• PB • SP mode • MH-2 Color bar	1. Connect an oscilloscope to TP405 and observe the signal level. 2. Connect jump wires between TP434, TP435 and GND. Again check the TP405 level. 3. Adjust R401 to obtain the same level.
6	0.5 H Delayed Video Level	TP221 TP222	R223	• LP mode • Color bar • REC then PB	**Note:** Perform the 0.5 H Delayed Video level adjustment after completing Delayed Color level. 1. Connect one channel of a dual trace oscilloscope to TP222 and the other channel to TP221. 2. Adjust R223 to obtain the same level in both cases.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
7	APC Error Phase  Color Burst Signal (A) (B) (7.8 kHz) 30 μsec **Fig. 2-4-3**	TP405 (PB Color) TP433 (7.8 kHz)	L401 (7.8 kHz TUNING)	• MH-2 Color bar • SP mode	1. Connect a jump wire between TP436 and GND. 2. Connect one channel of a dual trace oscilloscope to TP405 and the other channel to TP433 and observe the waveforms. 3. Adjust L401 to position the zero-cross 30 μsec ±3 μsec from the center of the burst signal as shown in Fig. 2-4-3.
8	0.5 H Delayed Jump DET	TP432 (VCO OUTPUT)	R418 (0.5H DELAYED Jump DET)	• No. Signal (AUX) • E-E	1. Supply 1/2 Vcc to TP431. 2. Connect a frequency counter to TP432. 3. Adjust R418 to obtain 30±0.2 kHz.
9	PB Frequency Response	MONITOR	R110 R202	• SP mode • Color bar • REC then PB • LP mode	1. Set the SHARPNESS Control (R402) of the OPERATION board to center click position. 2. Record then play back a color bar signal. 3. While observing the monitor, set R110 the optimum point. 4. Perform adjustment in the same manner as SP mode. 5. While observing the monitor, set R202 to the optimum point.
10	SECAM DET (*E/EG Models)  Set this point to center position between points "A" and "B". V = more than 4 Vp-p in REC V = 6.0±0.5 Vp-p in PB **Fig. 2-4-4**	TP310 (S DET ADJ)	L351 (1/2 fH TUNING) R355 SECAM DET. ADJ	• SECAM color bar • E-E • SP mode • REC then PB	1. Connect an oscilloscope to TP310. 2. Adjust L351 so that transition step becomes centered between "A" and "B" as shown in Fig. 2-4-4. 3. Record then playback. 4. Adjust R355 for 6.0±0.5 Vp-p.

2.5 AUDIO CIRCUIT (0 9 AUDIO board)

Note: Unless otherwise specified, test points and variable resistors are located on the AUDIO board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Audio Bias Level	TP31 BIAS LEVEL	R20 BIAS LEVEL	• REC • SP mode	1. Connect a digital voltmeter between TP31 and TP 32. 2. Set for REC mode without signal. 3. Adjust R15 for 3.0 mV±0.2 mVrms.
2	Audio PB Level	AUDIO OUT	R5 PB LEVEL	• REC • SP mode	1. Connect a oscilloscope to AUDIO OUT. 2. Supply an audio signal (−8 dBs/1 kHz) to AUDIO IN and record together with a VIDEO signal, then playback. 3. Adjust R5 so that the audio output level during playback becomes −6±1 dBs. **Note:** Use PERI CONNECTOR.

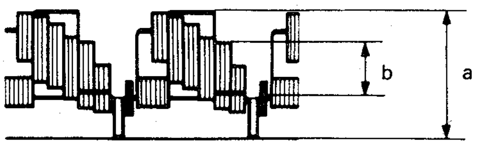
2.6 TIMER CIRCUIT (1 5 TIMER board)

Note: Unless otherwise specified, test points and variable resistors are located on the TIMER board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Timer Clock	TP2	C101	• E-E	1. Connect the frequency counter to TP2 (OSC OUT) and TP3 (GND). 2. Short GND and TP1 (TEST). Then short the leads of electrolytic capacitor C7 once in order to reset IC 1. 3. Adjust C101 for 2048.000 Hz±0.002 Hz or (488.2813±0.005 μ sec). **Note:** 1) Resetting IC 1 while TP1 and GND are shorted provides the TEST mode.

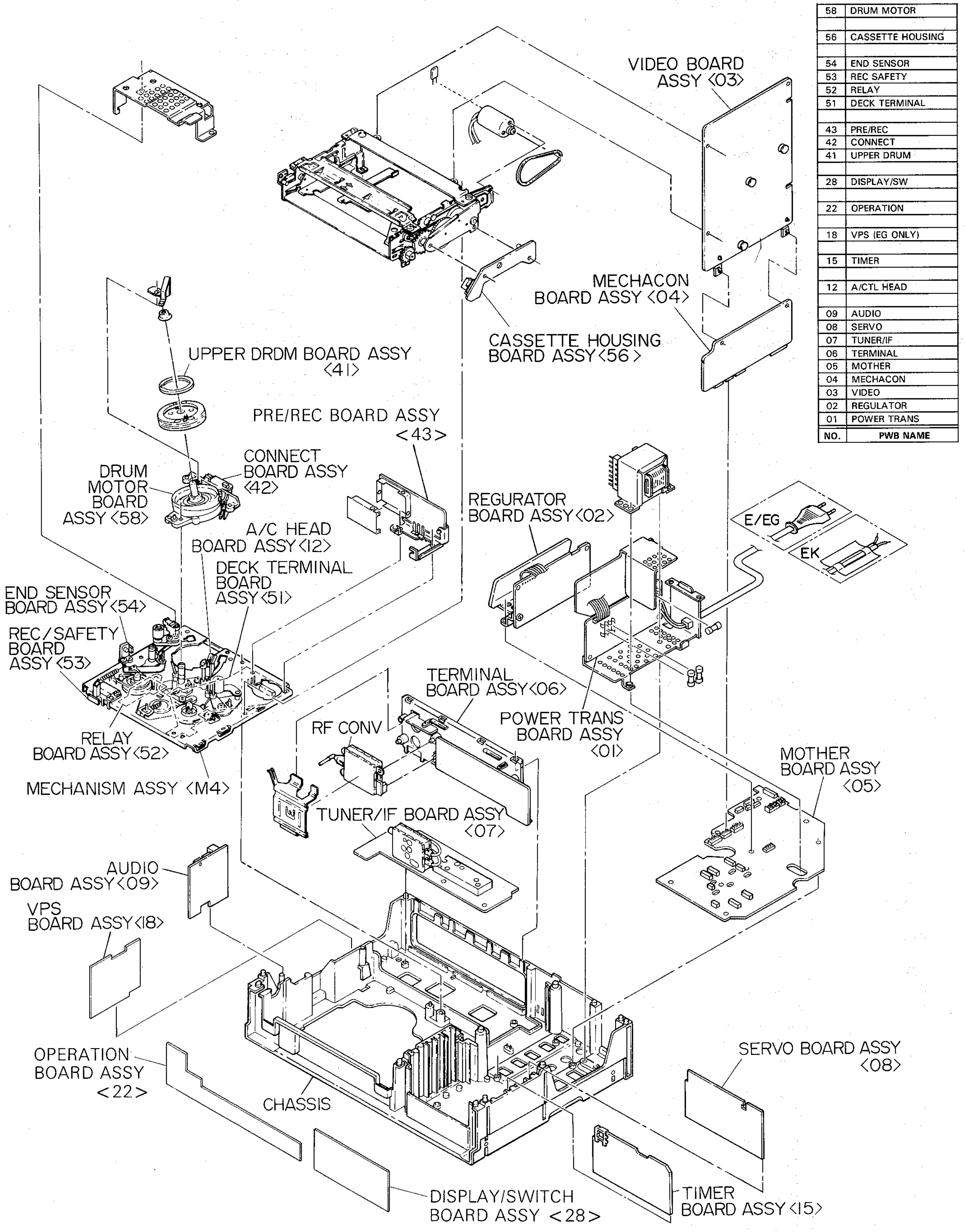
2.7 TUNER/IF CIRCUIT (0 7 TUNER/IF board)

Note: Unless otherwise specified, test points and variable resistors are located on the TUNER/IF board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	VCO	MONITOR	T2	• TV broadcast • Tuner mode	1. Receive a color broadcast. 2. Adjust T2 to obtain best picture on the monitor.
2	RF AGC	MONITOR	R11	• TV broadcast • Tuner mode	**Note:** Adjust R11 (RF AGC) to correct for excess noise in the picture or when streaky cross interference occurs due to strong electrical fields. 1. Adjust R11 to minimize noise or steaks on the TV screen. 2. Check for absence of abnormality on all channels.
3	VPS Y Level (E/EG only)	CN3-pin 1 (VPS OUT)	R16	• Modulated signal • Tuner mode	1. Receive an 87.5% modulated signal. Adjust R16 to obtain a maximum Y level (including sync) of 2.0 Vp-p from pin 1 (VPS OUT) of CN3.
4	Color Level  Y level = 1 Magneta level = 0.48 a : b = 1 : 0.48 **Fig. 2-7-1**	IC1-18 or TP110 (VIDEO	R42	• TV broadcast • Tuner mode	1. Supply a color bar signal from a TV channel signal generator and select the channel corresponding to the generator. 2. Adjust R42 to produce signal waveform as shown in Fig. 2-7-1. Altenate method 1. Receive a color broadcast. 2. Adjust R42 so that the burst level becomes 2/3 of the sync level.

SECTION 3
CHARTS AND DIAGRAMS

3.1 CIRCUIT BOARD LOCATIONS


VIDEO BOARD ASSY <03>
MECHACON BOARD ASSY <04>
CASSETTE HOUSING BOARD ASSY<56 >
UPPER DRDM BOARD ASSY <41>
PRE/REC BOARD ASSY <43>
CONNECT BOARD ASSY <42>
DRUM MOTOR BOARD ASSY <58>
A/C HEAD BOARD ASSY<12>
DECK TERMINAL BOARD ASSY<51>
REGURATOR BOARD ASSY<02>
E/EG
EK
END SENSOR BOARD ASSY<54>
REC/SAFETY BOARD ASSY<53>
RELAY BOARD ASSY<52>
MECHANISM ASSY <M4>
TERMINAL BOARD ASSY<06>
RF CONV
POWER TRANS BOARD ASSY <01>
MOTHER BOARD ASSY <05>
TUNER/IF BOARD ASSY <07>
AUDIO BOARD ASSY<09>
VPS BOARD ASSY<18>
OPERATION BOARD ASSY <22>
CHASSIS
SERVO BOARD ASSY <08>
DISPLAY/SWITCH BOARD ASSY <28>
TIMER BOARD ASSY<15>

NO.	PWB NAME
58	DRUM MOTOR
56	CASSETTE HOUSING
54	END SENSOR
53	REC SAFETY
52	RELAY
51	DECK TERMINAL
43	PRE/REC
42	CONNECT
41	UPPER DRUM
28	DISPLAY/SW
22	OPERATION
18	VPS (EG ONLY)
15	TIMER
12	A/CTL HEAD
09	AUDIO
08	SERVO
07	TUNER/IF
06	TERMINAL
05	MOTHER
04	MECHACON
03	VIDEO
02	REGULATOR
01	POWER TRANS

3.2 GENERAL INFORMATIONS

3.2.1 Connections

Note:
Unless otherwise specified, only signal input flow is indicated.
Connection arrows indicate only signal outputs.

1 2 3 : Connector

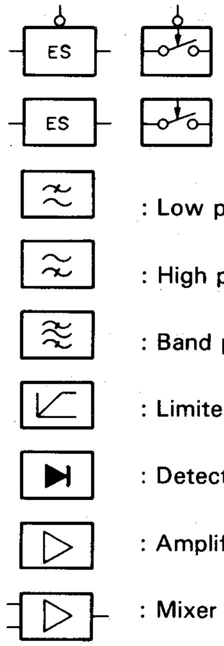
① ② ③ : Direct connection

1 2 3 : Board in connector

VS MS SM : Connected pattern in the board.
Abbreviations
V : Video M : Mechacon
S : Servo A : Audio
VS : Signal flow from video to servo.

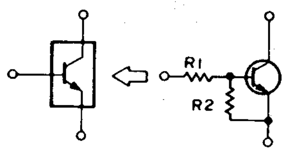
3.2.2 Indications

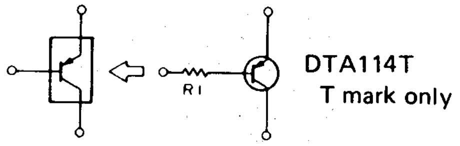
AUX : Active only at high.
$\overline{\text{AUX}}$: Active only at low.
$\bar{\text{A}}\bar{\text{U}}\bar{\text{X}}$: Active only at middle.
$\bar{\text{A}}\text{U}\bar{\text{X}}$: Active only at open.



: Active only at low for electronic switch.
: Active only at high for electronic switch.
: Low pass filter.
: High pass filter.
: Band pass filter.
: Limiter.
: Detector
: Amplifier.
: Mixer stage.

3.2.3 Digital transistor




R1
DTA114T
T mark only

Note:
The digital transistor includes built in resistors.
It features small size and high reliability.
Both PNP and NPN types are available.

Uses:
Inverter, Interface, driver circuits.

3.2.4 Siganl flow in the schematic

➡ Recording signal path
⇨ Playback signal path
➡ REC/PB signal path

3.2.5 Schematic diagram values

Unless otherwise specified.

1. All resistance values are in ohms, 1/6 W, 1/8 W, (refer to parts list).
2. All capacitance values are in μF, (P; PF).
3. All inductance values are in μH, (m; mH).
4. All diodes are 1SS133 or MA165, (refer to parts list).
5. Voltages are DC-measured (reference to ground) with a digital voltmeter during recording (SP mode) and playback (SP mode) with alignment tape. Where voltages differ between recording and playback, the voltage during playback is shown in parentheses.
6. Waveforms (VIDEO System) are measured (reference to ground) with a color bar during recording (SP mode) and playback (SP mode) with alignment tape.
7. Waveforms (AUDIO System) are measured (reference to ground) with 1 kHz (−8 dBs) during recording and playback with alignment tape (1 kHz).
8. Shaded (▨) parts are critical for safety.
Replace only with specified parts numbers.

3.3 ABBREVIATIONS USED IN THE SCHEMATIC DIAGRAM

A	AC	Alternating Current
	ACC	Automatic Color Control
	ACCEL	Acceleration
	A/CTL	Audio/Control
	ADC	Analog to Digital Converter
	ADD	Adder
	ADRS	Address
	ADJ	Adjustment
	A DUB	Audio Dubbing
	AE	Audio Erase
	AEF	Automatic Editing Function
	AFC	Automatic Frequency Control
	AFT	Automatic Fine Tuning
	AGC	Automatic Gain Control
	AH	Audio Head
	AL	After Loading
	ALC	Automatic Light Compensation Automatic Level Control
	AM	Amplitude Modulation
	AMP	Amplifier
	ANT	Antenna
	APC	Automatic Pedestal Control Automatic Phase Control
	APL	Average Picture Level
	A/S/M	Audio/Servo/Mechacon
	ASS'Y	Assembly
	ATT	Attenuator
	AUD	Audio
	AUTO	Automatic
	AUX	Auxiliary
B	B	Base
	BAL	Balance
	BATT	Battery
	BFP	Burst Flag Pulse
	BIT	Binary Digit
	BLK	Black, Blanking
	BLU	Blue
	BILING	Bilingual
	BPF	Bandpass Filter
	BRK	Brake
	BRN	Brown
	BT	Band Tuning
	BUFF	Buffer
	BW or B/W	Black and White
C	C	Capacitance, Collector, Color
	CAP	Capstan, Capacitor
	CAR	Carrier
	CARR	Carrier
	CASS	Cassette
	CCD	Charge Coupled Device
	CCT	Circuit
	CD	Count Down
	CE	Chip Enable
	CF	Ceramic Filter
	CH	Channel
	CHG	Charge
	CHROMA	Chrominance
	CLK	Clock
	CLR	Clear
	CMD	Command
	CNT	Count, Counter
	COL	Color
	COM	Common
	COMB	Combination Comb Filter
	COMP	Comparator Composite Compensation
	CONN	Connector
	CONV	Converter
	CP	Circuit Protector Clamp Pulse
	CPC	Capstan Phase Control
	CTL	Control
D	D	Drum, Digital, Diode, Drain
	DAC	Digital to Analog Converter
	dB	Decibel
	DC	Direct Current
	DEC	Decoder
	DEMOD	Demodulator
	DEMUX	Demultiplexer
	DET	Detector
	DEV	Deviation
	DIF	Differential
	DISCR	Discriminator
	DL	Delay Line
	DOC	Dropout Compensator
	DOD	Drop Out Detector
	DPC	Drum Phase Control
E	E	Edit, Emitter
	E-E	Electric to Electric
	EF	Emitter-Follower
	EMP	Emphasis
	EN	Enable
	ENC	Encoder
	ENV	Envelope
	EP	Extended Play
	EQ	Equalizer
	ES	Electronic Switch
	ESNS	End Sensor
	EXP	Expander
	EXT	External
F	F	Farad, Fuse
	F ADV	Frame Advance
	FDP	Fluorescent Display Panel
	FE	Full Erase
	FET	Field Effect Transistor
	FF	Fast Forward Flipflop
	FG	Frequency Generator
	FM	Frequency Modulation
	FMA	FM Audio
	FR	Full Recording, Frame, Fusible Resistor
	FREQ	Frequency
	F-V CONV	Frequency to Voltage Converter
	FWD	Forward
	FWD S	Forward Search
G	G	Green, Gate, Grid
	GEN	Generator
	GND	Ground
	GRN	Green
	GRY	Gray
H	H	High, Henry, Hour
	HG	Hall Generator
	HPF	Highpass Filter
	Hz	Herz
I	IC	Integrated Circuit
	ID	Identification (Pulse)
	IF	Intermediate Frequency
	IFR	Infrared
	IFT	Intermediate Frequency Transformer
	IND	Indicator
	INH	Inhibit
	INS	Insert
	INT	Internal, Interrupt
	INV	Inverter
	I/O	Input/Output
	IR	Infrared
L	L	Low, Left
	LIM	Limiter
	LIN	Linearity
	LOAD	Loading (Cassette)
	LP	Long Play
	LPF	Lowpass Filter
M	M	Motor, Mega
	MAX	Maximum
	MDA	Motor Drive Amplifier
	MECHACON	Mechanism Control
	MIC	Microphone
	MIN	Minimum
	MIX	Mixer, Mixing
	MMV	Monostable Multivibrator
	MOD	Modulation, Modulator
	MODEM	Modulator-Demodulator
	MON	Monitor
	MPX	Multiplexer, Multiplex
	MS	Mode Select
N	NAND	Not-And
	NC	Not Connected, Normally Closed
	NFB	Negative Feedback
	NLN	Non-Linear
	NO	Normally Open
	NOR	Normal, Not-Or
	NR	Noise Reduction
O	OP	Operation
	OPAMP	Operational Amplifier
	ORN	Orange
	OSC	Oscillator
P	PB	Playback
	PC	Photocoupler, Pulse Counter
	PCM	Pulse Code Modulation
	PG	Pulse Generator
	PGM	Program
	PI	Photo Interrupter
	PIF	Picture Intermediate Frequency
	PLA	Programmable Logic Array
	PLL	Phase Locked Loop
	POS	Position
	p-p	Peak-to-Peak
	PREAMP	Preamplifier
	P/S	Pause/Still
	PSC	Pulse Swallowing Control
	PU	Pickup
	PUT	Programmable Unijunction Transistor
	PWM	Pulse Width Modulation
	PWR	Power
Q	Q	Quality Factor
R	R	Red, Right
	RA	Resistor Array
	RAE	Random Access Enable
	RAM	Random Access Memory
	REC	Recording
	REF	Reference
	REG	Regulated, Regulator
	REM	Remote
	REMOCON	Remote Control (Unit)
	REV	Reverse
	REV S	Reverse Search
	REW	Rewind
	R/P	Record/Playback
	RPT	Repeat
	RST	Reset
	RT	Rotary Transformer
	RUN	Running
	RY	Relay
S	SAW	Sawtooth, Surface Acoustic Wave
	SC	Subcarrier, Simulcast
	SCH	Search
	SEL	Select, Selector
	SENS	Sensor
	SEP	Separator
	SF	Source Follower
	SFF	Short Fast Forward
	SIF	Sound Intermediate Frequency
	SHARP	Sharpness
	SN	Signal to Noise Ratio
	SOL	Solenoid
	SP	Standard Play
	SREV	Search Reverse
	SREW	Short Rewind
	S/S	Slow/Still
	SSG	Sync Signal Generator
	SSNS	Start Sensor
	STD	Strobe Data, Standard
	SUP	Supply
	SW	Switch
	SWD	Switched
	SYNC	Synchronization
T	TF	Thermal Fuse
	TIM	Timing
	TK	Tracking
	TNR	Tuner
	TP	Test Point
	TPZD	Trapezoid
	TR	Transistor, Trimmer
	TRANS	Transformer
	TU	Take-up
U	UL	Unloading
	UNREG	Unregulated
	UNSW	Unswitched
V	V	Vertical, Volt
	VCO	Voltage Controlled Oscillator
	VD	Vertical Drive
	VIF	Video Intermediate Frequency
	VLT	Violet
	VR	Variable Resistor
	VS	Video and Sync
	V/T	Video/Television
	V/U	VHF/UHF
	VXO	Variable Crystal Oscillator
W	W	Watt
	W & D	White and Dark
	WHT	White
X	XTAL	Crystal
Y	Y	Luminance
	YEL	Yellow

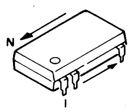
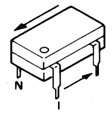
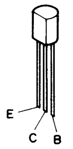
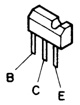
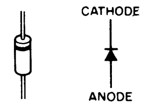
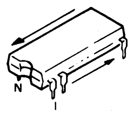
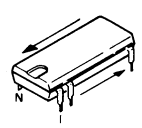
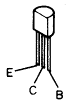
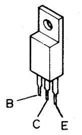
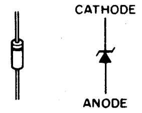
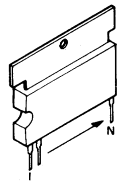
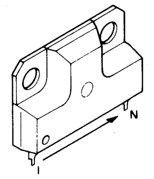
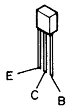
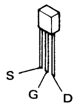
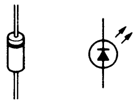
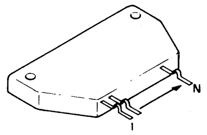
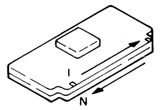
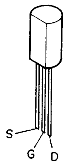
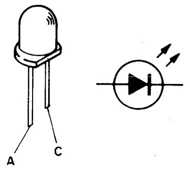
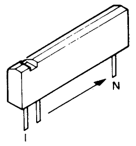
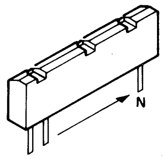
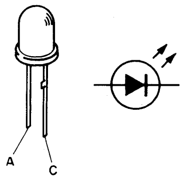
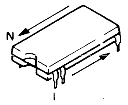
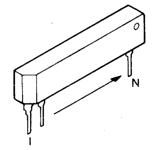
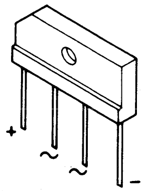
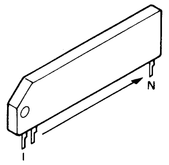
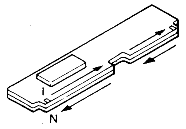
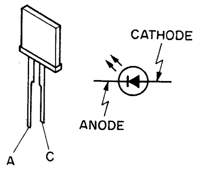
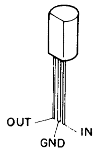
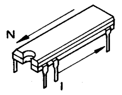
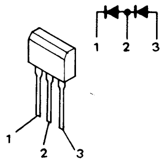
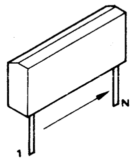
3.4 MAIN TYPES OF ACTIVE AND PACKAGE CIRCUITS

INTEGRATED CIRCUIT		
	NAME	L
A	AN3592K	6A
	AN3994NK	
B	BA7007	6B
	BA7021	6B
	BX6325	
H	HA11870NT	6A
	HD49703NT	2A
L	LA7224	6B
M	MSM6989RS	2B
	M50440-394SP	
	M50440-397SP	
	M50965-628SP	2B
	M51365P	2A
	M51796P	
	M5278L05	7A
	M54644BL	3B
	M58655P	
P	PU22046A	4B
	PU22282A	7B
S	STK5481	4A
	S-8053ALB	8A
T	TA7374P	8B
	TA8400P	6A
U	UPC324C	6A
	UPD75216ACW-041	
	UPD7538ACU-214	6A
	UPD82C43CY	8B
V	VC2023A-2	6A
	7VT12	9A

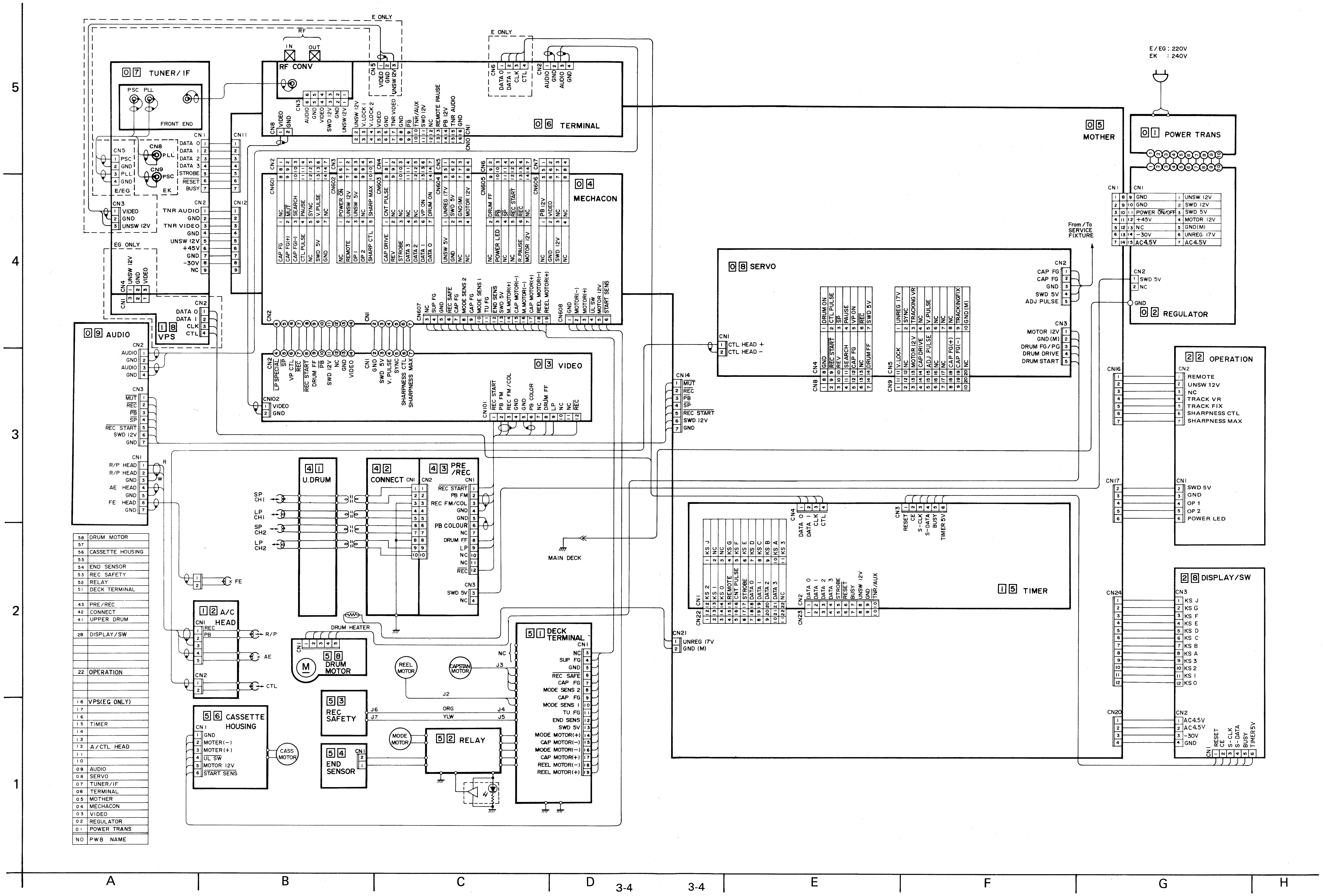
TRANSISTOR		
	NAME	L
D	DTA124ES	3C
	DTA144EF	1D
	DTA144WS	3C
	DTC114ES	3C
	DTC124ES	3C
	DTC143ES	3C
	DTC144ES	3C
	DTC144WS	3C
P	PN268R	
2SA	2SA1309	3C
	2SA720	2C
	2SA933	3C
2SB	2SB1010	3C
	2SB1030	3C
	2SB641	1D
	2SB643	1D
	2SB808	3C
2SC	2SC1317	2C
	2SC1740	3C
	2SC2655	1C
	2SC3311	3C
	2SC3327	3C
	2SC3354	1D
2SD	2SD1449	3C
	2SD1468	1C
	2SD1863	
	2SD636	1D
	2SD637	1D
2SK	2SK381	4C
	2SK656	3D

DIODE		
	NAME	L
D	DA210S	8E
	PD49PI	7E
E	ERA15-02	1E
	E-452-2	2E
H	HZS7.5EB2	2E
	HZS9.1EB1	
	HZ30-2	2E
	HZS4.7EB2	2E
	HZS5.6EB1	2E
	HZS6.8EB2	2E
M	MA161	1E
	MA165	1E
	MA27W(A)	7E
	MTZJ5.1B	
	MTZ10B	2E
	MTZ12B	2E
	MTZ5.1B	2E
	MTZ7.5B	2E
O	OA90	1E
R	RD6.2ES-T1B1	2E
	RD8.2EB1	2E
	RD7.5EB2	2E
	RD9.1ES-T1B2	2E
S	SLR-34VC3F	4E
	S4VB10	5E
	S5688G	1E
	1SS132	1E
	1SS133	1E
	10E2	1E

Note: FOR INSTANCE, AN3592 →
6A: SEE COLUMN 6, LINE A

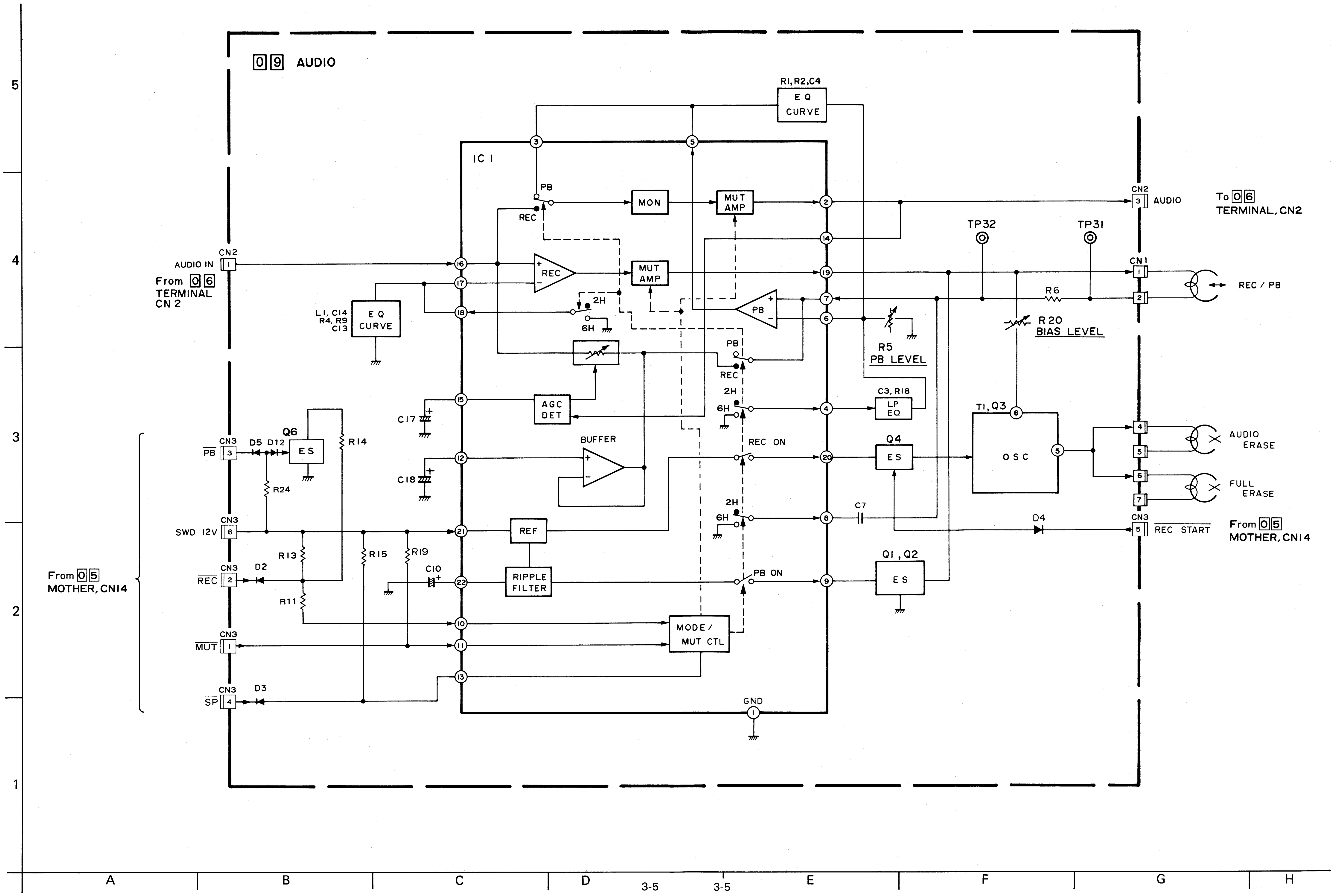
	Integrated Circuit		Transistor		Diode
	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					
9					

3.5 BOARD INTERCONNECTION DIAGRAM

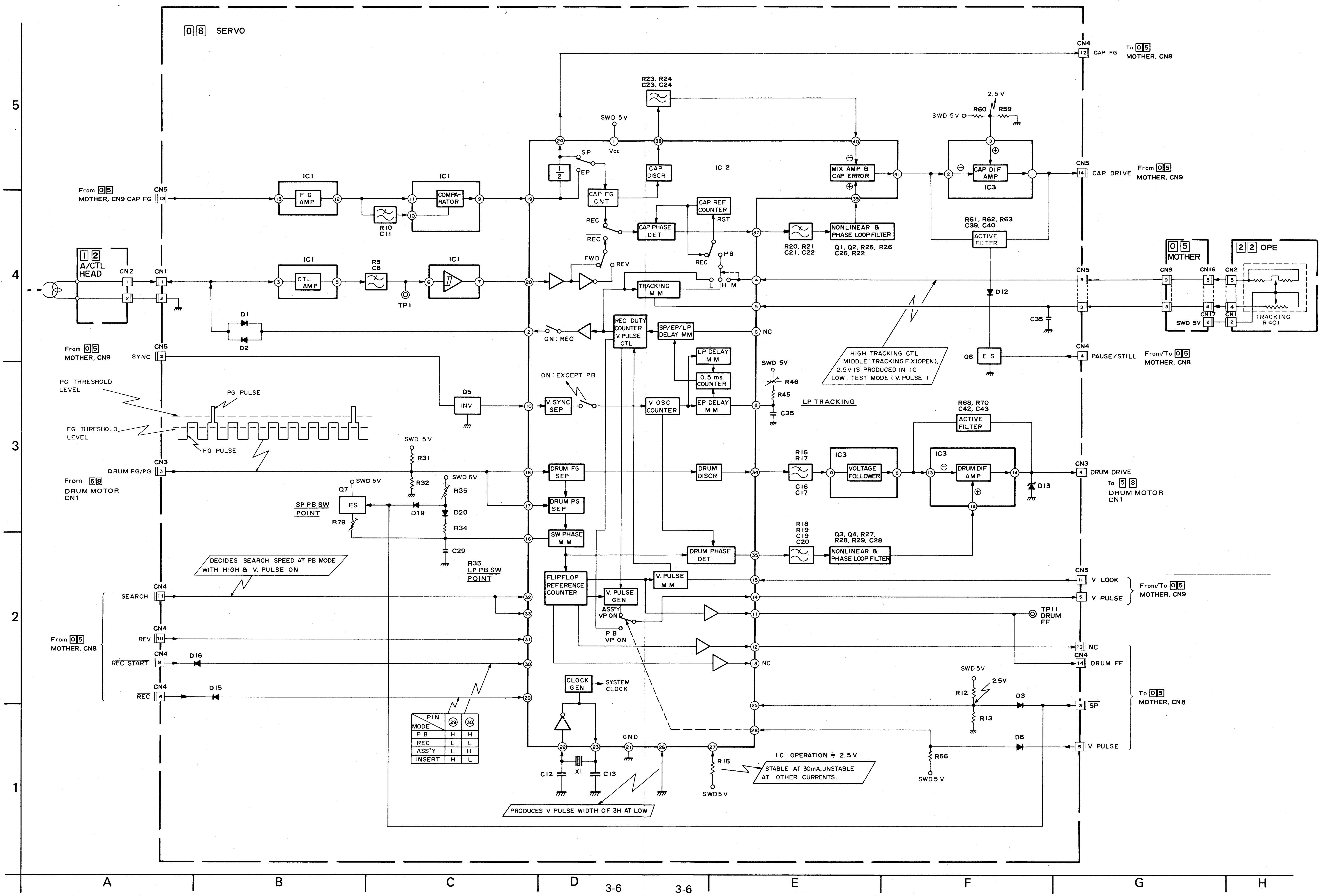

07 TUNER/IF
FRONT END
PSC PLL
E/EG
EK
EG ONLY
18 VPS
09 AUDIO
RF CONV
RF
IN
OUT
E ONLY
06 TERMINAL
04 MECHACON
03 VIDEO
05 MOTHER
01 POWER TRANS
02 REGULATOR
E/EG : 220V
EK : 240V
08 SERVO
From/To SERVICE FIXTURE
22 OPERATION
28 DISPLAY/SW
15 TIMER
41 U.DRUM
42 CONNECT
43 PRE/REC
12 A/C HEAD
58 DRUM MOTOR
DRUM HEATER
56 CASSETTE HOUSING
CASS MOTOR
53 REC SAFETY
54 END SENSOR
52 RELAY
MODE MOTOR
REEL MOTOR
CAPSTAN MOTOR
51 DECK TERMINAL
MAIN DECK
R/P
AE
CTL
FE
ORG
YLW
A
B
C
D
E
F
G
H
1
2
3
4
5

NO	PWB NAME
58	DRUM MOTOR
57	
56	CASSETTE HOUSING
55	
54	END SENSOR
53	REC SAFETY
52	RELAY
51	DECK TERMINAL
43	PRE/REC
42	CONNECT
41	UPPER DRUM
28	DISPLAY/SW
22	OPERATION
18	VPS(EG ONLY)
17	
16	
15	TIMER
14	
13	
12	A/CTL HEAD
11	
10	
09	AUDIO
08	SERVO
07	TUNER/IF
06	TERMINAL
05	MOTHER
04	MECHACON
03	VIDEO
02	REGULATOR
01	POWER TRANS

3.6 AUDIO BLOCK DIAGRAM

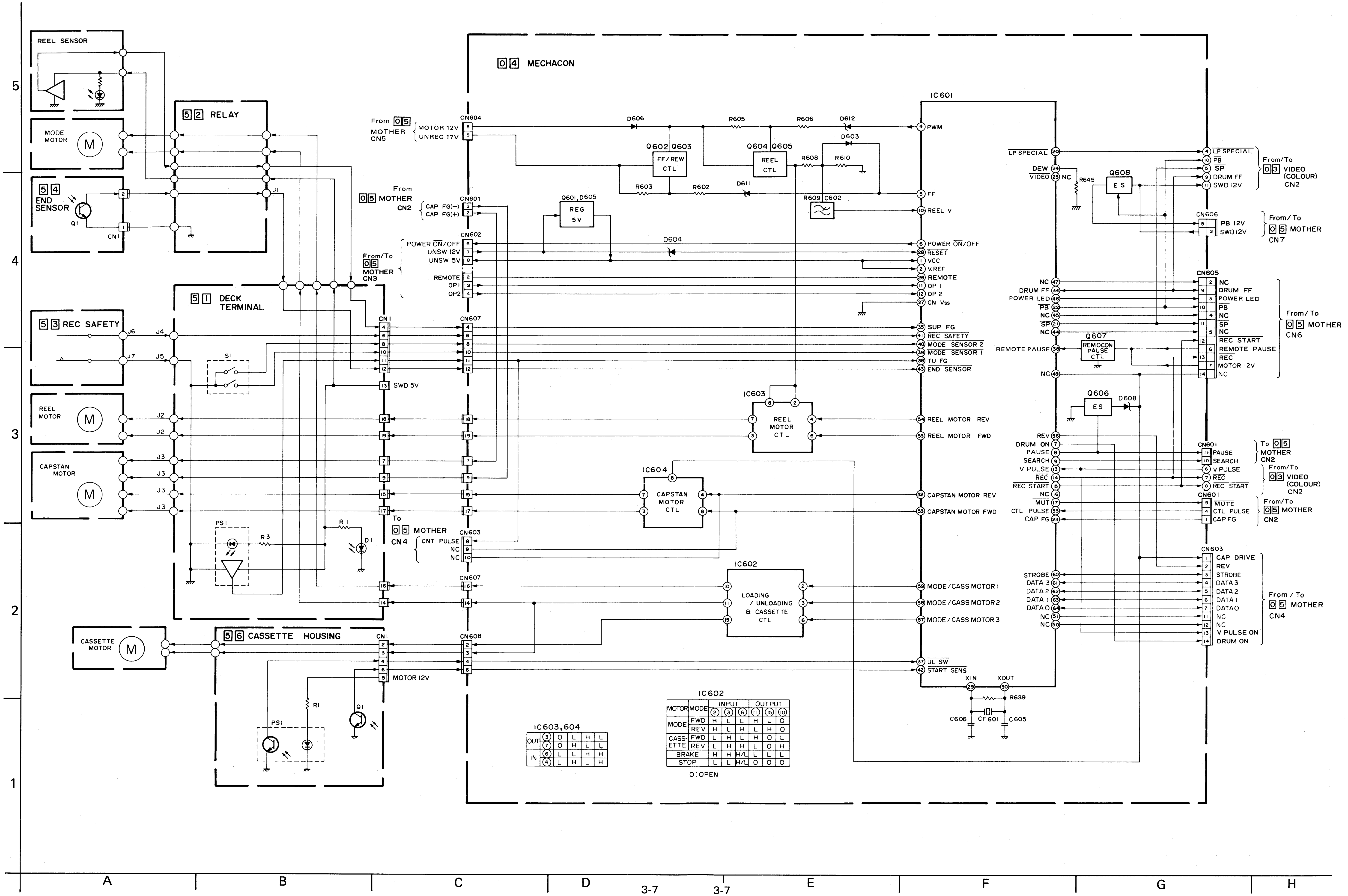

09 AUDIO
R1, R2, C4
EQ CURVE
IC 1
PB
REC
MON
MUT AMP
2H
6H
L1, C14
R4, R9
C13
EQ CURVE
AUDIO IN
CN2
From 06 TERMINAL CN 2
MUT AMP
PB
AGC DET
BUFFER
C17
C18
REF
RIPPLE FILTER
MODE / MUT CTL
GND
REC ON
PB ON
Q6
ES
D5
D12
R14
R24
R13
R15
R19
C10
R11
D2
D3
CN3
PB
SWD 12V
REC
MUT
SP
From 05 MOTHER, CN14
CN2
AUDIO
To 06 TERMINAL, CN2
TP32
TP31
CN1
REC / PB
R6
R20
BIAS LEVEL
R5
PB LEVEL
C3, R18
LP EQ
T1, Q3
OSC
Q4
ES
AUDIO ERASE
FULL ERASE
C7
D4
CN3
REC START
From 05 MOTHER, CN14
Q1, Q2
ES
1
2
3
4
5
A
B
C
D
E
F
G
H

3.7 SERVO BLOCK DIAGRAM


08 SERVO
IC 2
From 05 MOTHER, CN9 CAP FG
CN5 18
IC1 F G AMP
IC1 COMPA-RATOR
R10 C11
CN4 12 CAP FG To 05 MOTHER, CN8
R23, R24 C23, C24
SWD 5V
Vcc
1/2
SP
EP
CAP FG CNT
CAP DISCR
REC
REC
CAP PHASE DET
CAP REF COUNTER
RST
PB
REC
MIX AMP & CAP ERROR
NONLINEAR & PHASE LOOP FILTER
R20, R21 C21, C22
Q1, Q2, R25, R26 C26, R22
2.5 V
SWD 5 V
R60
R59
CAP DIF AMP
IC3
CN5 14 CAP DRIVE From 05 MOTHER, CN9
R61, R62, R63 C39, C40
ACTIVE FILTER
D12
C35
12 A/CTL HEAD
CN2
CN1
IC1 CTL AMP
R5 C6
TP1
IC1
FWD
REV
TRACKING M M
L H M
D1
D2
ON : REC
REC DUTY COUNTER V. PULSE CTL
SP/EP/LP DELAY MM
NC
05 MOTHER
22 OPE
CN9 CN16 CN2
CN17 CN1
SWD 5V
TRACKING R401
From 05 MOTHER, CN9
SYNC
CN5 2
Q5 INV
ON : EXCEPT PB
V. SYNC SEP
V OSC COUNTER
LP DELAY M M
0.5 ms COUNTER
EP DELAY M M
SWD 5V
R46
R45
C35
LP TRACKING
HIGH : TRACKING CTL
MIDDLE : TRACKING FIX (OPEN), 2.5V IS PRODUCED IN IC
LOW : TEST MODE (V. PULSE)
Q6 E S
CN4 4 PAUSE/STILL From/To 05 MOTHER, CN8
PG THRESHOLD LEVEL
PG PULSE
FG THRESHOLD LEVEL
FG PULSE
CN3 DRUM FG/PG 3
From 58 DRUM MOTOR CN1
SWD 5V
R31
R32
SWD 5V
R35
Q7 ES
SWD 5V
SP PB SW POINT
R79
D19
D20
R34
C29
R35 LP PB SW POINT
DRUM FG SEP
DRUM PG SEP
SW PHASE M M
DRUM DISCR
DRUM PHASE DET
R16 R17
C16 C17
IC3 VOLTAGE FOLLOWER
R68, R70 C42, C43
ACTIVE FILTER
IC3 DRUM DIF AMP
D13
CN3 4 DRUM DRIVE To 58 DRUM MOTOR CN1
R18 R19 C19 C20
Q3, Q4, R27, R28, R29, C28
NONLINEAR & PHASE LOOP FILTER
DECIDES SEARCH SPEED AT PB MODE WITH HIGH & V. PULSE ON
FLIPFLOP REFERENCE COUNTER
V. PULSE M M
V. PULSE GEN
ASS'Y VP ON
P B VP ON
CN5 11 V LOOK
5 V PULSE
From/To 05 MOTHER, CN9
TP11 DRUM FF
NC
CN4 14 DRUM FF
NC
CN4 SEARCH 11
CN4 REV 10
CN4 REC START 9
D16
CN4 REC 6
D15
From 05 MOTHER, CN8
CLOCK GEN
SYSTEM CLOCK
GND
C12
X1
C13
R15
SWD5V
IC OPERATION ≒ 2.5 V
STABLE AT 30mA, UNSTABLE AT OTHER CURRENTS.
PRODUCES V PULSE WIDTH OF 3H AT LOW
SWD5V
2.5V
R12
R13
D3
3 SP
D8
5 V PULSE
R56
SWD5 V
To 05 MOTHER, CN8
1 2 3 4 5
A B C D E F G H

PIN MODE	29	30
P B	H	H
REC	L	L
ASS'Y	L	H
INSERT	H	L

3.8 MECHANISM CONTROL BLOCK DIAGRAM


REEL SENSOR
MODE MOTOR
M
52 RELAY
54 END SENSOR
Q1
CN1
J1
53 REC SAFETY
J6
J7
J4
J5
51 DECK TERMINAL
S1
CN1
SWD 5V
REEL MOTOR
J2
CAPSTAN MOTOR
J3
PS1
R3
R1
D1
To 05 MOTHER CN4
CASSETTE MOTOR
56 CASSETTE HOUSING
MOTOR 12V
PS1
R1
Q1
04 MECHACON
From 05 MOTHER CN5
MOTOR 12V
UNREG 17V
CN604
From 05 MOTHER CN2
CAP FG(−)
CAP FG(+)
CN601
From/To 05 MOTHER CN3
POWER ON/OFF
UNSW 12V
UNSW 5V
REMOTE
OP1
OP2
CN602
CN607
CN603
CNT PULSE
NC
NC
CN607
CN608
D606
Q602 Q603
FF/REW CTL
R603
R602
Q601, D605
REG 5V
D604
R605
Q604 Q605
REEL CTL
D611
R606
D612
D603
R608
R610
R609 C602
IC601
PWM
FF
REEL V
POWER ON/OFF
RESET
VCC
V.REF
REMOTE
OP 1
OP 2
CN Vss
SUP FG
REC SAFETY
MODE SENSOR 2
MODE SENSOR 1
TU FG
END SENSOR
IC603
REEL MOTOR CTL
REEL MOTOR REV
REEL MOTOR FWD
IC604
CAPSTAN MOTOR CTL
CAPSTAN MOTOR REV
CAPSTAN MOTOR FWD
IC602
LOADING / UNLOADING & CASSETTE CTL
MODE/CASS MOTOR 1
MODE/CASS MOTOR 2
MODE/CASS MOTOR 3
UL SW
START SENS
XIN
XOUT
R639
C606
CF601
C605
LP SPECIAL
DEW
VIDEO
NC
R645
Q608
ES
LP SPECIAL
PB
SP
DRUM FF
SWD 12V
From/To 03 VIDEO (COLOUR) CN2
CN606
PB 12V
SWD 12V
From/To 05 MOTHER CN7
CN605
NC
DRUM FF
POWER LED
PB
NC
SP
NC
REC START
REMOTE PAUSE
REC
MOTOR 12V
NC
From/To 05 MOTHER CN6
Q607
REMOCON PAUSE CTL
REMOTE PAUSE
Q606
ES
D608
REV
DRUM ON
PAUSE
SEARCH
V PULSE
REC
REC START
NC
MUT
CTL PULSE
CAP FG
CN601
PAUSE
SEARCH
To 05 MOTHER CN2
V PULSE
REC
REC START
From/To 03 VIDEO (COLOUR) CN2
CN601
MUTE
CTL PULSE
CAP FG
From/To 05 MOTHER CN2
STROBE
DATA 3
DATA 2
DATA 1
DATA 0
NC
NC
CN603
CAP DRIVE
REV
STROBE
DATA 3
DATA 2
DATA 1
DATA 0
NC
NC
V PULSE ON
DRUM ON
From / To 05 MOTHER CN4
5
4
3
2
1
A
B
C
D
E
F
G
H

IC603,604

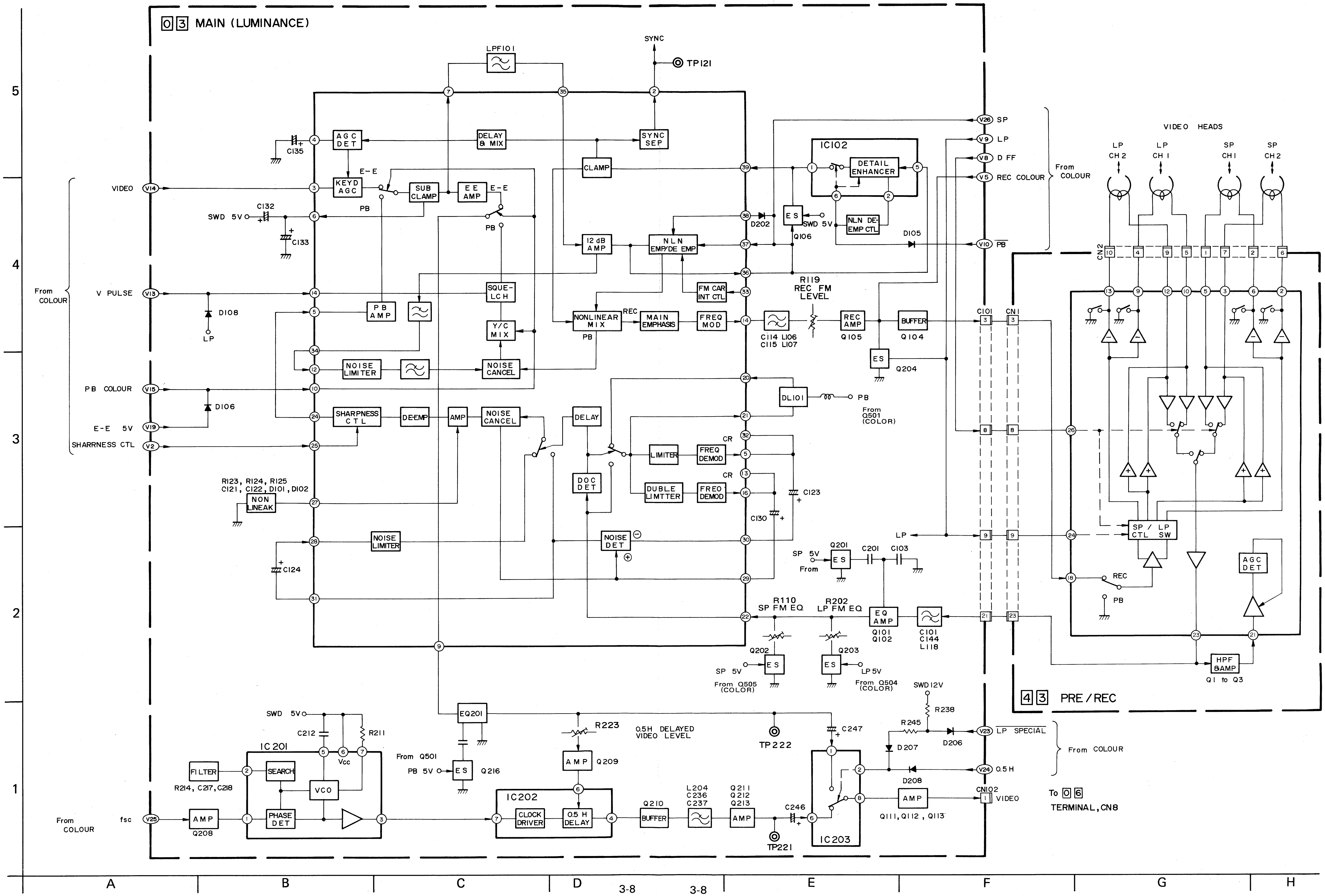
OUT	③	O	L	H	L
	⑦	O	H	L	L
IN	⑥	L	L	H	H
	④	L	H	L	H

IC602

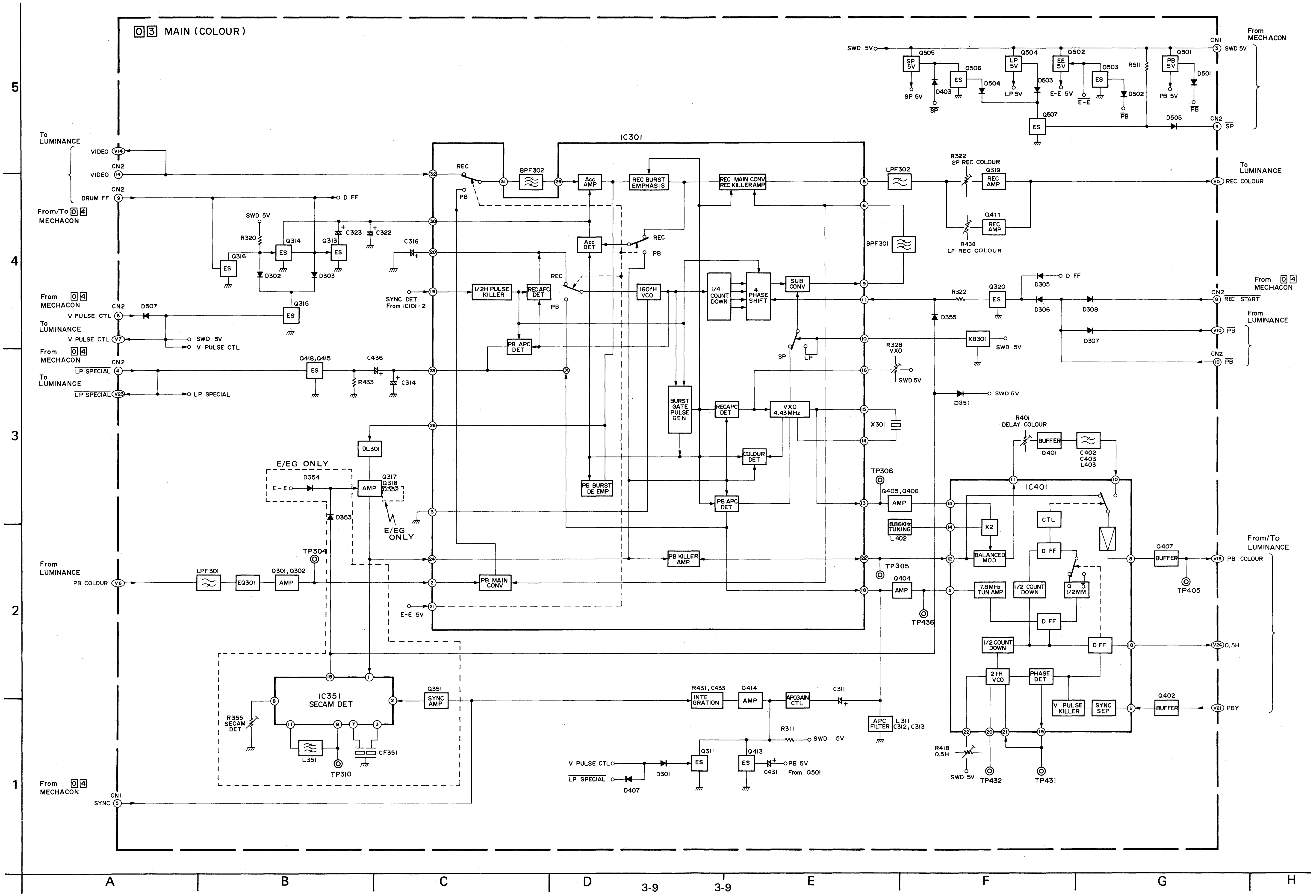
MOTOR	MODE	INPUT			OUTPUT		
		②	③	⑥	⑪	⑮	⑩
MODE	FWD	H	L	L	H	L	O
	REV	H	L	H	L	H	O
CASS-ETTE	FWD	L	H	L	H	O	L
	REV	L	H	H	L	O	H
BRAKE		H	H	H/L	L	L	L
STOP		L	L	H/L	O	O	O

O: OPEN

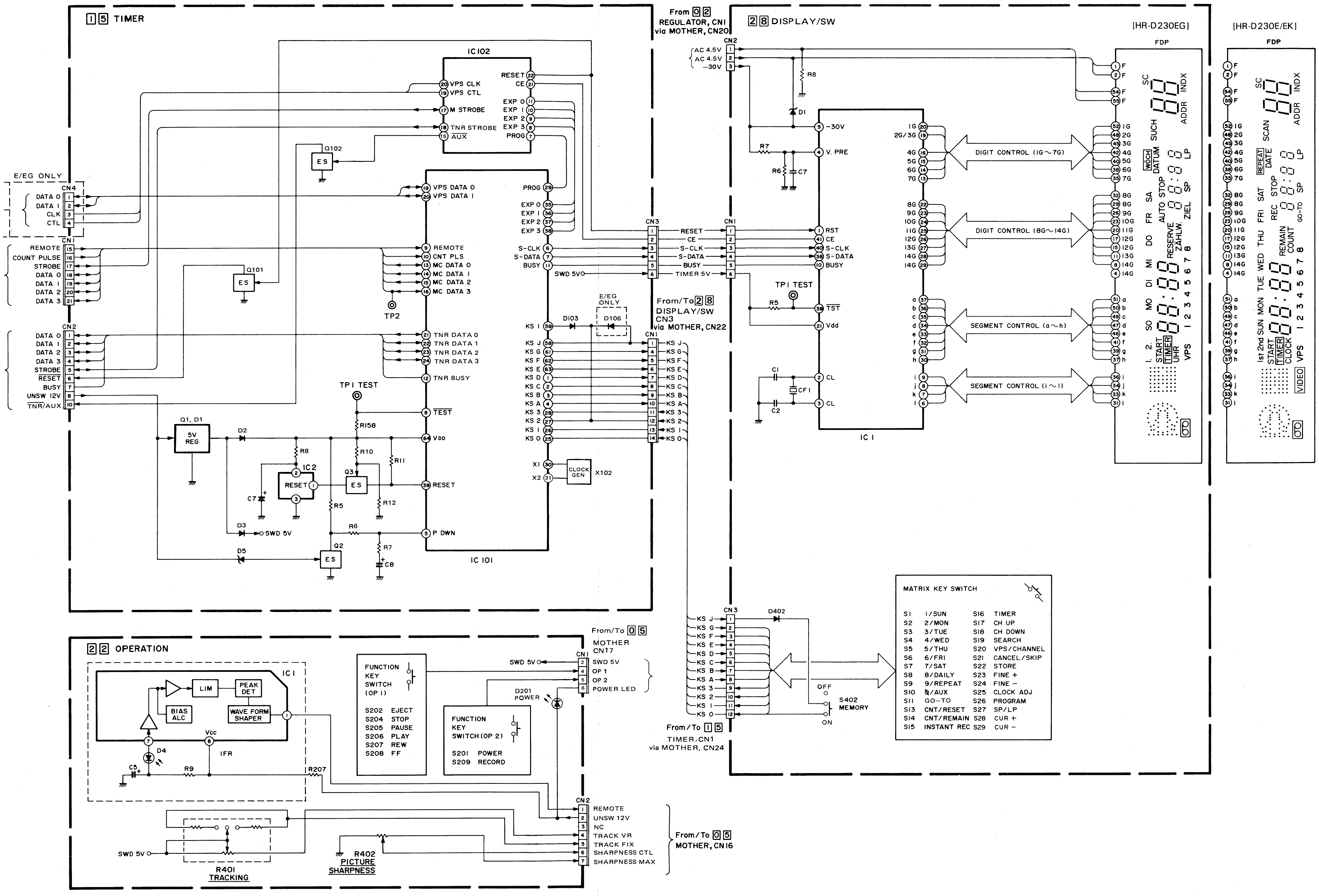
3.9 VIDEO (LUMINANCE) AND PRE/REC BLOCK DIAGRAM


03 MAIN (LUMINANCE)
43 PRE / REC
LPF101
SYNC
TP121
AGC DET
DELAY & MIX
SYNC SEP
CLAMP
KEYD AGC
SUB CLAMP
EE AMP
E-E
PB
C135
C132
C133
SWD 5V
VIDEO
V PULSE
PB COLOUR
E-E 5V
SHARRNESS CTL
From COLOUR
D108
LP
D106
PB AMP
SQUE-LCH
Y/C MIX
NOISE LIMITER
NOISE CANCEL
SHARPNESS CTL
DE-EMP
AMP
DELAY
12 dB AMP
NLN EMP/DE EMP
NONLINEAR MIX
REC
MAIN EMPHASIS
FREQ MOD
FM CAR INT CTL
IC102
DETAIL ENHANCER
NLN DE-EMP CTL
ES
Q106
D202
D105
R119 REC FM LEVEL
C114 L106
C115 L107
REC AMP
Q105
BUFFER
Q104
Q204
DL101
PB
From Q501 (COLOR)
LIMITER
FREQ DEMOD
DUBLE LIMTTER
CR
C123
C130
DOC DET
NOISE DET
R123, R124, R125
C121, C122, D101, D102
NON LINEAK
C124
SP 5V
From
Q201
C201
C103
R110 SP FM EQ
R202 LP FM EQ
EQ AMP
Q101 Q102
C101 C144 L118
Q202
Q203
LP 5V
From Q505 (COLOR)
From Q504 (COLOR)
SP
LP
D FF
REC COLOUR
From COLOUR
V26
V9
V8
V5
V10
C101
CN1
CN2
VIDEO HEADS
LP CH 2
LP CH 1
SP CH 1
SP CH 2
SP / LP CTL SW
AGC DET
REC
HPF & AMP
Q1 to Q3
SWD 5V
C212
R211
IC 201
FILTER
SEARCH
VCO
PHASE DET
Vcc
R214, C217, C218
From COLOUR
fsc
AMP
Q208
EQ201
From Q501
PB 5V
Q216
IC202
CLOCK DRIVER
0.5 H DELAY
R223
AMP
Q209
0.5H DELAYED VIDEO LEVEL
TP222
TP221
Q210
BUFFER
L204 C236 C237
Q211 Q212 Q213
C246
C247
IC203
SWD 12V
R238
R245
D207
D206
D208
LP SPECIAL
0.5 H
From COLOUR
AMP
Q111, Q112, Q113
CN102
VIDEO
To 06 TERMINAL, CN8
1
2
3
4
5
A
B
C
D
E
F
G
H

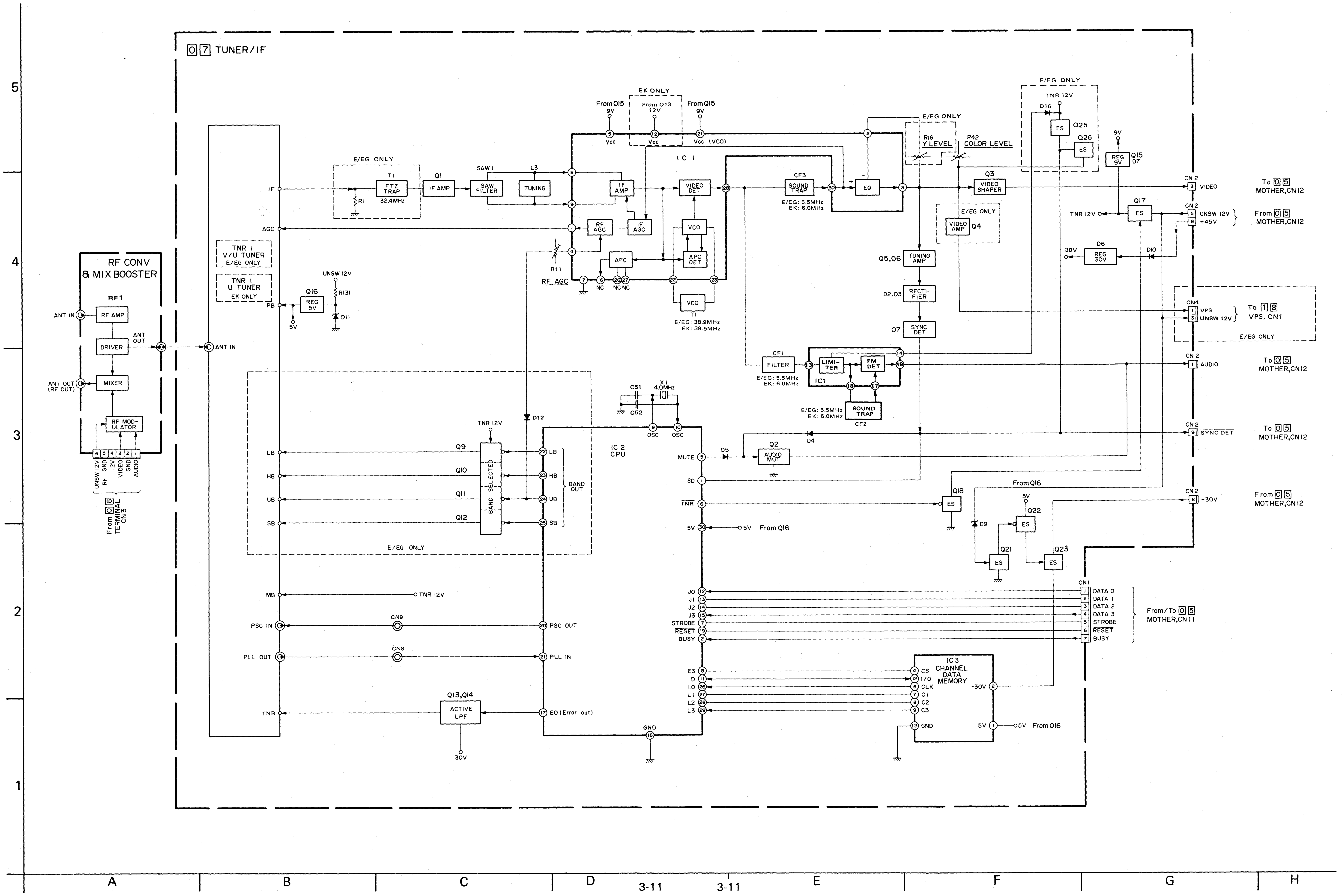
3.10 VIDEO (COLOR) BLOCK DIAGRAM


03 MAIN (COLOUR)
IC301
IC351 SECAM DET
IC401
From MECHACON
CN1 SWD 5V
SWD 5V
SP 5V
Q505
Q506
ES
D403
D504
LP 5V
Q504
D503
E-E 5V
EE 5V
Q502
Q503
D502
R511
PB 5V
Q501
D501
D505
Q507
CN2 SP
To LUMINANCE
VIDEO V14
CN2 VIDEO 14
CN2 DRUM FF 9
From/To 04 MECHACON
D FF
SWD 5V
R320
Q314
Q313
C323
C322
C316
Q316
D302
D303
Q315
From 04 MECHACON
CN2 V PULSE CTL 6
D507
To LUMINANCE V PULSE CTL V7
SWD 5V
V PULSE CTL
From 04 MECHACON CN2 LP SPECIAL 4
To LUMINANCE LP SPECIAL V23
LP SPECIAL
Q418, Q415
C436
R433
C314
SYNC DET From IC101-2
REC
PB
BPF302
Acc AMP
REC BURST EMPHASIS
REC MAIN CONV REC KILLER AMP
Acc DET
1/2H PULSE KILLER
REC AFC DET
PB APC DET
160fH VCO
1/4 COUNT DOWN
4 PHASE SHIFT
SUB CONV
BURST GATE PULSE GEN
REC APC DET
VXO 4.43MHz
COLOUR DET
PB BURST DE EMP
PB APC DET
PB KILLER AMP
PB MAIN CONV
DL301
SP
LP
LPF302
BPF301
R322 SP REC COLOUR
Q319 REC AMP
Q411 REC AMP
R438 LP REC COLOUR
To LUMINANCE REC COLOUR V5
D FF
D305
R322
Q320
D306
D308
From 04 MECHACON CN2 REC START 8
From LUMINANCE PB V10
D307
CN2 PB 10
D355
XB301
SWD 5V
R328 VXO
SWD 5V
D351
X301
R401 DELAY COLOUR
BUFFER Q401
C402 C403 L403
TP306
Q405, Q406 AMP
8.86KHz TUNING L402
X2
BALANCED MOD
CTL
D FF
7.8MHz TUN AMP
1/2 COUNT DOWN
Q / Q 1/2MM
D FF
1/2 COUNT DOWN
D FF
2fH VCO
PHASE DET
V PULSE KILLER
SYNC SEP
TP305
Q404 AMP
TP436
Q407 BUFFER
From/To LUMINANCE PB COLOUR V15
TP405
0.5H V24
Q402 BUFFER
PBY V21
R418 0.5H
SWD 5V
TP432
TP431
E/EG ONLY
D354
E-E
AMP Q317 Q318 Q352
E/EG ONLY
D353
TP304
From LUMINANCE PB COLOUR V6
LPF301
EQ301
Q301, Q302 AMP
E-E 5V
R355 SECAM DET
L351
TP310
CF351
Q351 SYNC AMP
From 04 MECHACON CN1 SYNC 5
R431, C433 INTEGRATION
Q414 AMP
APC GAIN CTL
C311
R311
SWD 5V
APC FILTER L311 C312, C313
V PULSE CTL
LP SPECIAL
D407
D301
Q311 ES
Q413 ES
C431
PB 5V From Q501
1 2 3 4 5
A B C D E F G H

'IMER, DISPLAY/SWITCH AND OPERATION BLOCK DIAGRAMS

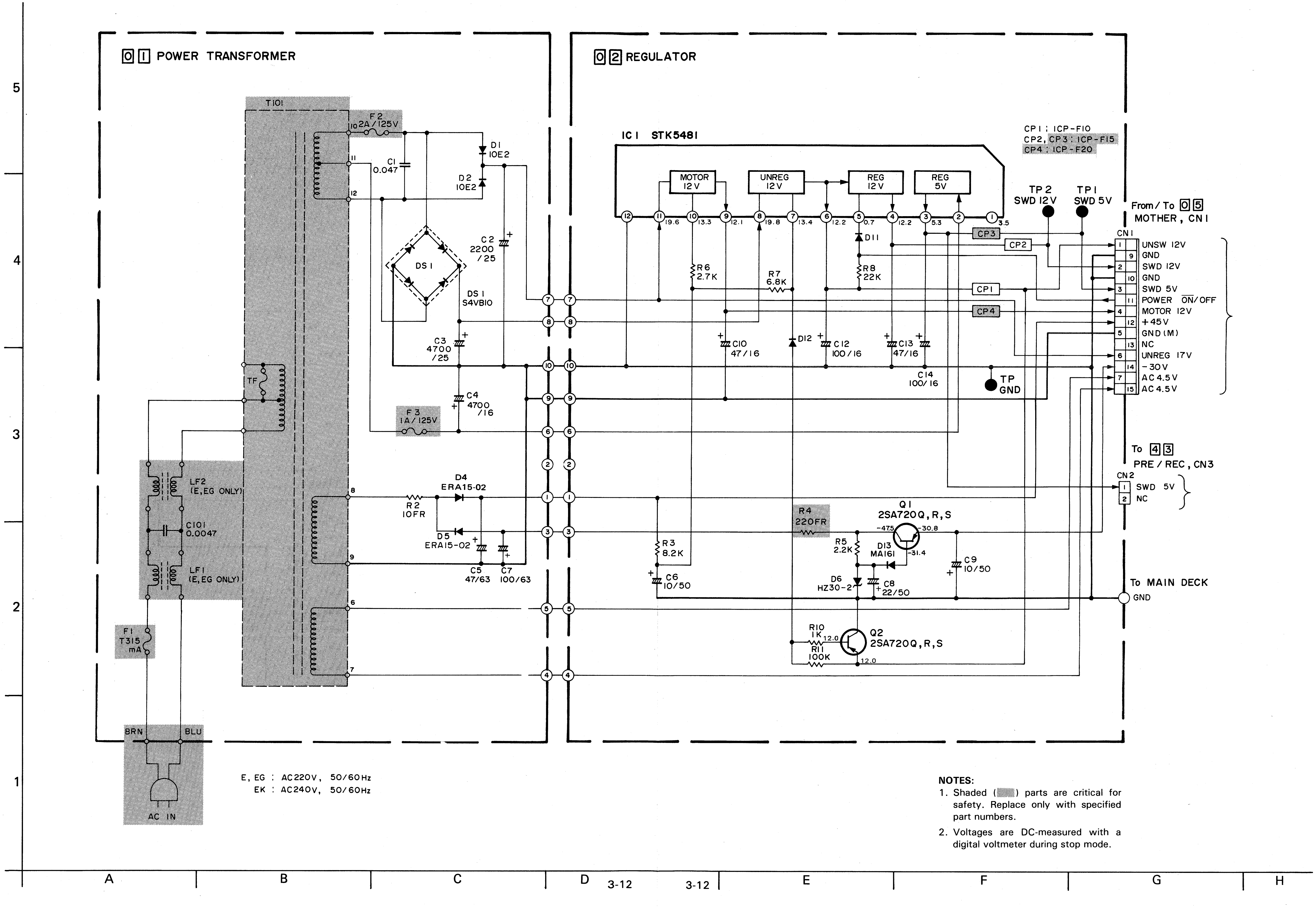

15 TIMER
IC102
VPS CLK
VPS CTL
M STROBE
TNR STROBE
AUX
RESET
CE
EXP 0
EXP 1
EXP 2
EXP 3
PROG
Q102
ES
E/EG ONLY
CN4
DATA 0
DATA 1
CLK
CTL
CN1
REMOTE
COUNT PULSE
STROBE
DATA 0
DATA 1
DATA 2
DATA 3
Q101
VPS DATA 0
VPS DATA 1
REMOTE
CNT PLS
MC DATA 0
MC DATA 1
MC DATA 2
MC DATA 3
TP2
CN2
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
UNSW 12V
TNR/AUX
TNR DATA 0
TNR DATA 1
TNR DATA 2
TNR DATA 3
TNR BUSY
TP1 TEST
TEST
Q1, D1
5V REG
D2
R8
R158
R10
R11
IC2
RESET
Q3
VDD
C7
R5
R12
D3
SWD 5V
R6
P DWN
D5
Q2
R7
C8
IC 101
S-CLK
S-DATA
BUSY
SWD 5V
D103
E/EG ONLY
D106
KS I
KS J
KS G
KS F
KS E
KS D
KS C
KS B
KS A
KS 3
KS 2
KS 1
KS 0
X1
X2
CLOCK GEN
X102
CN3
RESET
CE
S-CLK
S-DATA
BUSY
TIMER 5V
From/To 28 DISPLAY/SW CN3 via MOTHER, CN22
From 02 REGULATOR, CN1 via MOTHER, CN20
28 DISPLAY/SW
CN2
AC 4.5V
AC 4.5V
-30V
R8
D1
R7
R6
C7
-30V
V. PRE
RST
CE
S-CLK
S-DATA
BUSY
TP1 TEST
R5
TST
Vdd
C1
CF1
C2
CL
CL
IC 1
1G
2G/3G
4G
5G
6G
7G
8G
9G
10G
11G
12G
13G
14G
DIGIT CONTROL (1G~7G)
DIGIT CONTROL (8G~14G)
SEGMENT CONTROL (a~h)
SEGMENT CONTROL (i~l)
[HR-D230EG]
FDP
[HR-D230E/EK]
FDP
SC INDX ADDR SUCH WOCH DATUM AUTO STOP RESERVE ZÄHLW. ZIEL SP LP
SC INDX ADDR SCAN REPEAT DATE REC STOP REMAIN COUNT GO-TO SP LP
SA FR DO MI DI MO SO 1 2 START TIMER UHR VPS 1 2 3 4 5 6 7 8
SAT FRI THU WED TUE MON SUN 1st 2nd START TIMER CLOCK VPS VIDEO 1 2 3 4 5 6 7 8
MATRIX KEY SWITCH
S1 1/SUN
S2 2/MON
S3 3/TUE
S4 4/WED
S5 5/THU
S6 6/FRI
S7 7/SAT
S8 8/DAILY
S9 9/REPEAT
S10 0/AUX
S11 GO-TO
S13 CNT/RESET
S14 CNT/REMAIN
S15 INSTANT REC
S16 TIMER
S17 CH UP
S18 CH DOWN
S19 SEARCH
S20 VPS/CHANNEL
S21 CANCEL/SKIP
S22 STORE
S23 FINE +
S24 FINE −
S25 CLOCK ADJ
S26 PROGRAM
S27 SP/LP
S28 CUR +
S29 CUR −
CN3
D402
OFF
ON
S402 MEMORY
From/To 15 TIMER, CN1 via MOTHER, CN24
22 OPERATION
IC1
LIM
PEAK DET
BIAS ALC
WAVE FORM SHAPER
Vcc
IFR
D4
C5
R9
R207
FUNCTION KEY SWITCH (OP 1)
S202 EJECT
S204 STOP
S205 PAUSE
S206 PLAY
S207 REW
S208 FF
FUNCTION KEY SWITCH (OP 2)
S201 POWER
S209 RECORD
D201 POWER
From/To 05 MOTHER CN17
CN1
SWD 5V
OP 1
OP 2
POWER LED
CN2
REMOTE
UNSW 12V
NC
TRACK VR
TRACK FIX
SHARPNESS CTL
SHARPNESS MAX
From/To 05 MOTHER, CN16
SWD 5V
R401 TRACKING
R402 PICTURE SHARPNESS

3.12 TUNER/IF BLOCK DIAGRAM



07 TUNER/IF
RF CONV & MIX BOOSTER
RF1
ANT IN
RF AMP
DRIVER
ANT OUT
MIXER
ANT OUT (RF OUT)
RF MOD-ULATOR
UNSW 12V
GND
RF
12V
VIDEO
GND
AUDIO
From 06 TERMINAL CN3
TNR 1 V/U TUNER E/EG ONLY
TNR 1 U TUNER EK ONLY
IF
AGC
PB
ANT IN
LB
HB
UB
SB
MB
PSC IN
PLL OUT
TNR
Q16
REG 5V
5V
UNSW 12V
R131
D11
E/EG ONLY
T1
FTZ TRAP
32.4MHz
R1
Q1
IF AMP
SAW1
SAW FILTER
L3
TUNING
EK ONLY
From Q15 9V
From Q13 12V
From Q15 9V
Vcc
Vcc (VCO)
IC 1
IF AMP
VIDEO DET
RF AGC
IF AGC
VCO
AFC
APC DET
VCO
T1
E/EG: 38.9MHz
EK: 39.5MHz
R11
RF AGC
NC
CF3
SOUND TRAP
E/EG: 5.5MHz
EK: 6.0MHz
EQ
E/EG ONLY
R16 Y LEVEL
R42 COLOR LEVEL
Q3
VIDEO SHAPER
E/EG ONLY
VIDEO AMP
Q4
Q5,Q6
TUNING AMP
D2,D3
RECTI-FIER
Q7
SYNC DET
E/EG ONLY
TNR 12V
D16
ES
Q25
Q26
9V
REG 9V
Q15
D7
Q17
TNR 12V
30V
D6
REG 30V
D10
CN2
VIDEO
To 05 MOTHER,CN12
UNSW 12V
+45V
From 05 MOTHER,CN12
CN4
VPS
UNSW 12V
To 18 VPS, CN1
E/EG ONLY
CF1
FILTER
E/EG: 5.5MHz
EK: 6.0MHz
LIMI-TER
FM DET
IC1
SOUND TRAP
CF2
AUDIO
SYNC DET
C51
X1 4.0MHz
C52
OSC
OSC
IC 2 CPU
MUTE
SD
TNR
5V
From Q16
D5
Q2
AUDIO MUT
D4
D12
TNR 12V
Q9
Q10
Q11
Q12
BAND SELECTED
BAND OUT
E/EG ONLY
TNR 12V
CN9
CN8
PSC OUT
PLL IN
Q13,Q14
ACTIVE LPF
30V
EO (Error out)
GND
Q18
From Q16
5V
Q22
D9
Q21
Q23
-30V
J0
J1
J2
J3
STROBE
RESET
BUSY
CN1
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
From/To 05 MOTHER,CN11
E3
D
LO
L1
L2
L3
IC3 CHANNEL DATA MEMORY
CS
I/O
CLK
C1
C2
C3
GND
-30V
5V
5V From Q16
1
2
3
4
5
A
B
C
D
E
F
G
H

3.13 POWER SUPPLY SCHEMATIC DIAGRAMS

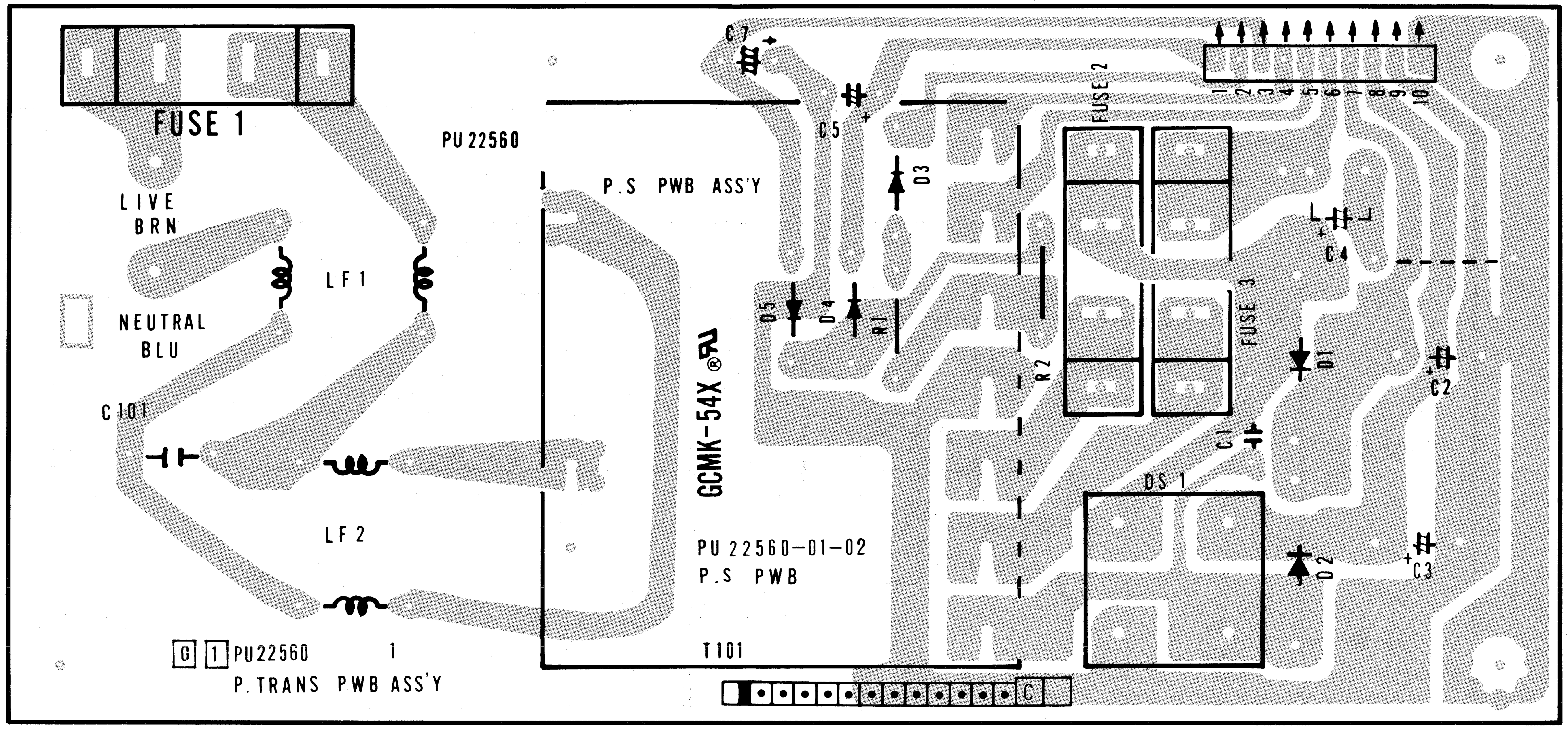

01 POWER TRANSFORMER
02 REGULATOR
T101
F2 2A/125V
D1 10E2
D2 10E2
C1 0.047
C2 2200 /25
DS1
DS1 S4VB10
C3 4700 /25
C4 4700 /16
F3 1A/125V
TF
LF2 (E,EG ONLY)
C101 0.0047
LF1 (E,EG ONLY)
F1 T315 mA
D4 ERA15-02
R2 10FR
D5 ERA15-02
C5 47/63
C7 100/63
BRN
BLU
AC IN
E, EG : AC220V, 50/60Hz
EK : AC240V, 50/60Hz
IC1 STK5481
MOTOR 12V
UNREG 12V
REG 12V
REG 5V
19.6
13.3
12.1
19.8
13.4
12.2
0.7
12.2
5.3
3.5
D11
R6 2.7K
R7 6.8K
R8 22K
C10 47/16
D12
C12 100/16
C13 47/16
C14 100/16
CP1 : ICP-F10
CP2, CP3 : ICP-F15
CP4 : ICP-F20
CP1
CP2
CP3
CP4
TP2 SWD 12V
TP1 SWD 5V
TP GND
From/To 05 MOTHER, CN1
CN1
UNSW 12V
GND
SWD 12V
GND
SWD 5V
POWER ON/OFF
MOTOR 12V
+45V
GND(M)
NC
UNREG 17V
-30V
AC4.5V
AC4.5V
To 43 PRE/REC, CN3
CN2
SWD 5V
NC
R4 220FR
Q1 2SA720Q,R,S
-47.5
-30.8
-31.4
R5 2.2K
D13 MA161
R3 8.2K
C6 10/50
D6 HZ30-2
C8 22/50
C9 10/50
To MAIN DECK
GND
R10 1K
R11 100K
12.0
Q2 2SA720Q,R,S
12.0
A
B
C
D
E
F
G
H
1
2
3
4
5

NOTES:

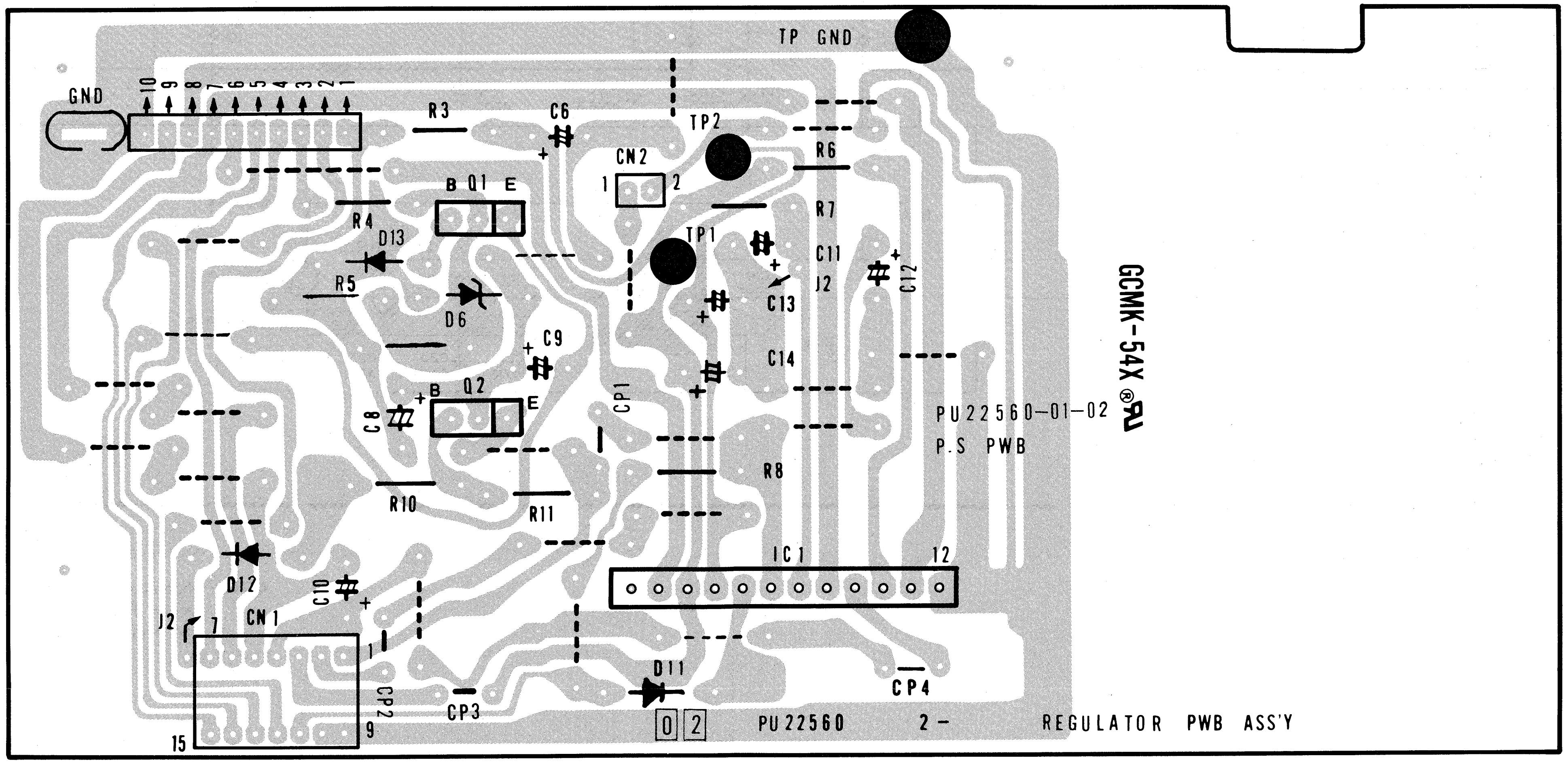
1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

3.14 POWER SUPPLY CIRCUIT BOARDS

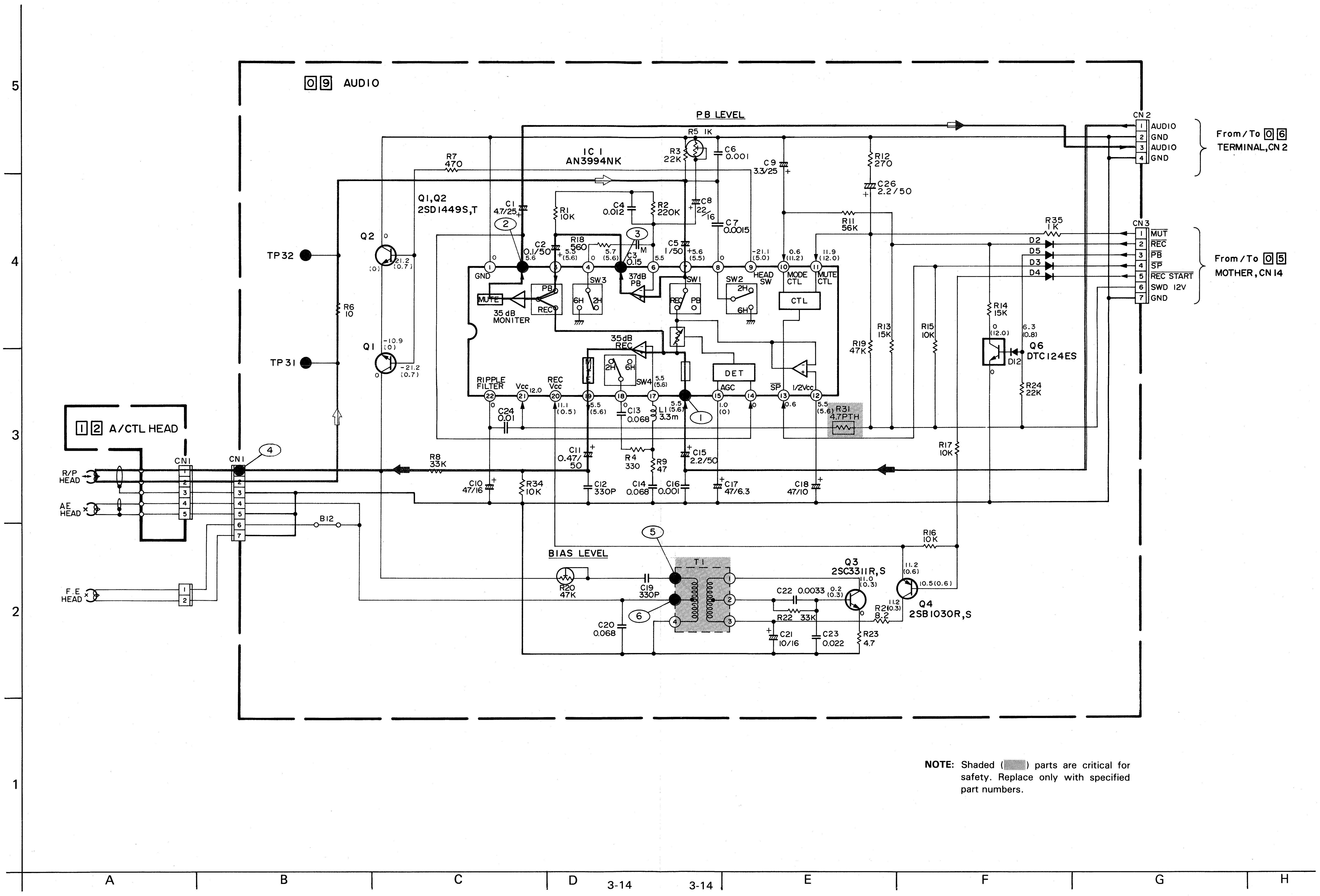
—POWER TRANSFORMER—


FUSE 1
PU 22560
LIVE
BRN
LF 1
NEUTRAL
BLU
C 101
LF 2
0 1 PU22560 1
P.TRANS PWB ASS'Y
P.S PWB ASS'Y
GCMK-54X
PU 22560-01-02
P.S PWB
T101
C7
C5
D3
D5
D4
R1
R2
FUSE 2
FUSE 3
1 2 3 4 5 6 7 8 9 10
C4
D1
C2
C1
DS 1
D2
C3
C

—REGULATOR—


TP GND
GND
10 9 8 7 6 5 4 3 2 1
R3
C6
TP2
CN2
1 2
R6
B Q1 E
R7
R4
D13
TP1
C11
J2
C12
R5
D6
C13
C9
C14
GCMK-54X
C8
B Q2 E
CP1
PU22560-01-02
P.S PWB
R8
R10
R11
IC1
12
D12
C10
J2 7
CN 1
1
CP2
CP3
D11
CP4
15
9
0 2
PU22560 2-
REGULATOR PWB ASS'Y
5
4
3
2
1
A
B
C
D
E
F
G
H

3.15 AUDIO SCHEMATIC DIAGRAM



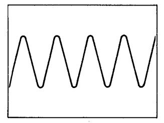
09 AUDIO
PB LEVEL
IC 1
AN3994NK
R5 1K
R3 22K
C6 0.001
C9 33/25
R12 270
C26 2.2/50
R7 470
Q1,Q2
2SD1449S,T
C1 47/25
R1 10K
C4 0.012
R2 220K
C8 22/16
C7 0.0015
R11 56K
R35 1K
C2 0.1/50
R18 560
C3 0.15
C5 1/50
Q2
TP32
TP31
Q1
R6 10
GND
MUTE
35 dB MONITER
PB
REC
SW3
6H
2H
37dB PB
SW1
SW2
HEAD SW
MODE CTL
MUTE CTL
CTL
35dB REC
SW4
DET
AGC
RIPPLE FILTER
Vcc
REC Vcc
SP
1/2Vcc
C24 0.01
C13 0.068
L1 3.3m
R31 4.7PTH
R13 15K
R15 10K
R19 47K
R14 15K
Q6 DTC124ES
D12
R24 22K
D2
D5
D3
D4
CN2
AUDIO
GND
AUDIO
GND
From/To 06 TERMINAL,CN2
CN3
MUT
REC
PB
SP
REC START
SWD 12V
GND
From/To 05 MOTHER,CN14
12 A/CTL HEAD
CN1
R/P HEAD
AE HEAD
F.E HEAD
R8 33K
C11 0.47/50
R4 330
R9 47
C15 2.2/50
R17 10K
C10 47/16
R34 10K
C12 330P
C14 0.068
C16 0.001
C17 47/6.3
C18 47/10
B12
BIAS LEVEL
T1
R20 47K
C19 330P
C20 0.068
Q3 2SC3311R,S
R16 10K
C22 0.0033
R22 33K
R21 8.2
Q4 2SB1030R,S
C21 10/16
C23 0.022
R23 4.7
① ② ③ ④ ⑤ ⑥
5
4
3
2
1
A
B
C
D
E
F
G
H

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.16 AUDIO AND AUDIO/CONTROL HEAD CIRCUIT BOARDS

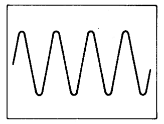
—Waveforms of AUDIO circuit—

1



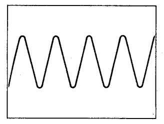
IC1-16
REC 20 mVp-p

2



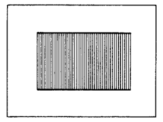
IC1-2
0.7 Vp-p
REC, PB

3



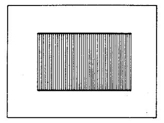
IC1-5
PB 20 mVp-p

4



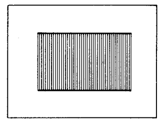
CN1-1
REC 49 Vp-p

5



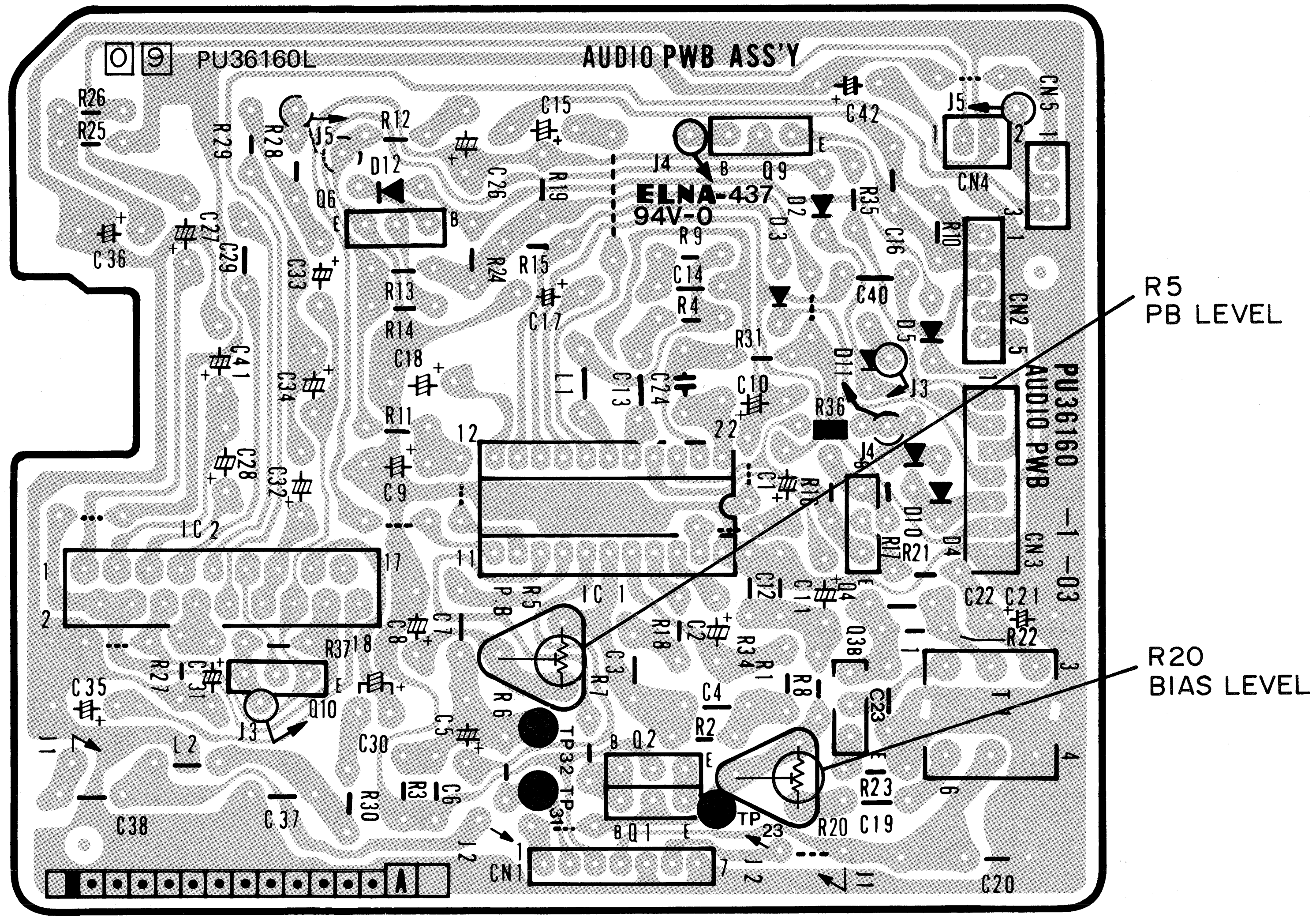
T1-6
REC 70 Vp-p

6



T1-5
REC 32 Vp-p

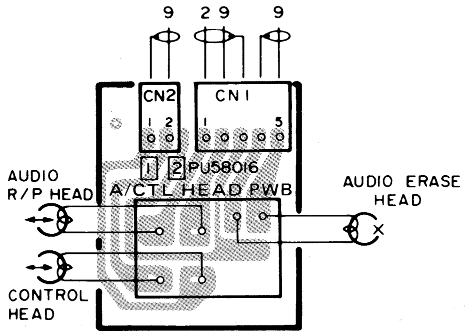
—AUDIO—


0 9 PU36160L
AUDIO PWB ASS'Y
PU36160 AUDIO PWB -1 -03
ELNA-437 94V-0
IC 1
IC 2
CN1
CN2
CN3
CN4
CN5
J1
J2
J3
J4
J5
Q2
Q6
Q9
Q10
Q1
Q3
Q4
T1
TP32
TP31
TP23
R5
R6
R7
R20
R36

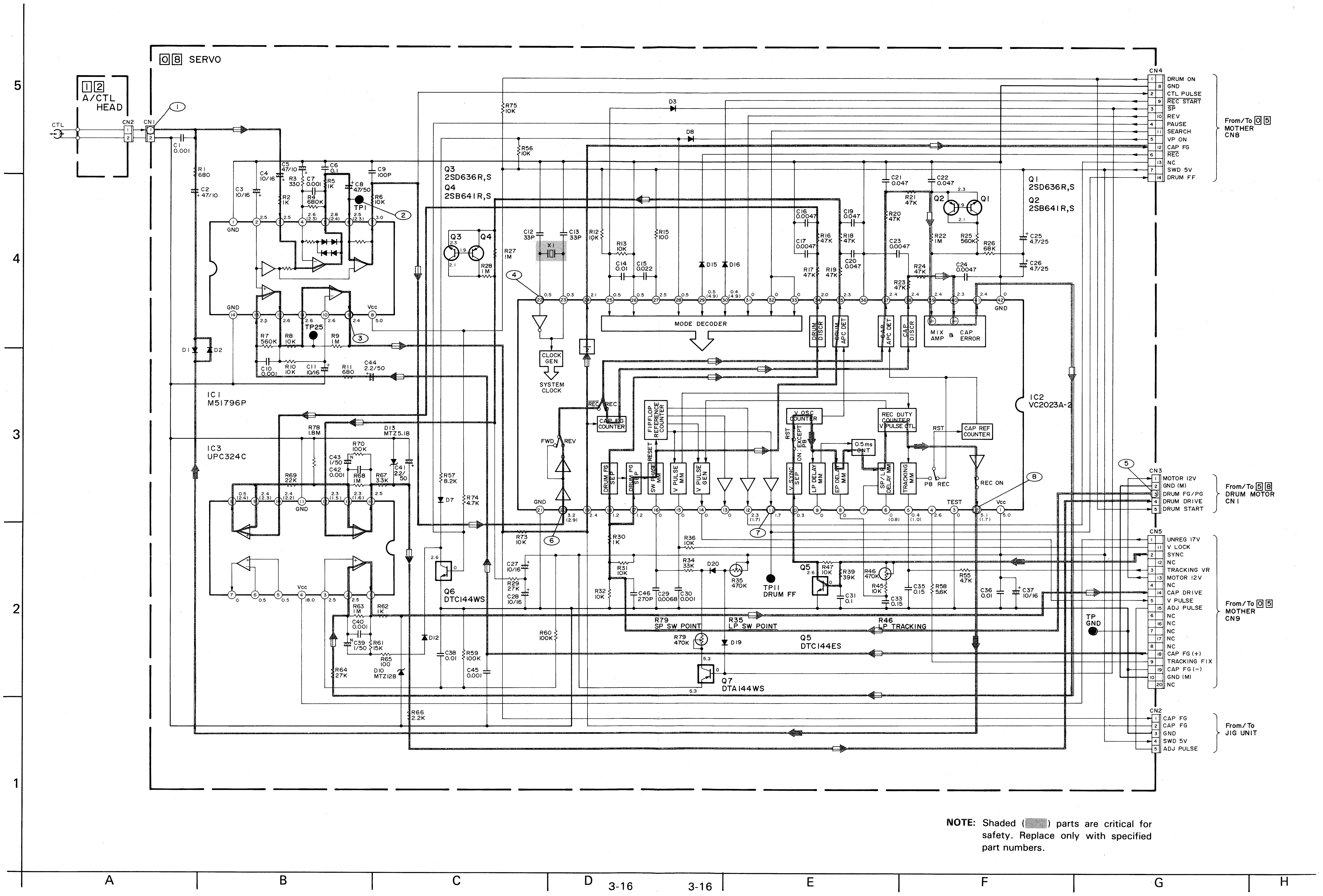
R5
PB LEVEL

R20
BIAS LEVEL

—AUDIO/CONTROL HEAD—


9
2 9
9
CN2
CN1
1 2
1 5
1 2 PU58016
A/CTL HEAD PWB
AUDIO R/P HEAD
AUDIO ERASE HEAD
CONTROL HEAD

3.17 SERVO SCHEMATIC DIAGRAM



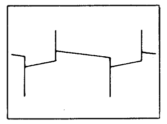
08 SERVO
12 A/CTL HEAD
CTL
CN1
CN2
IC1 M51796P
IC2 VC2023A-2
IC3 UPC324C
Q1 2SD636R,S
Q2 2SB641R,S
Q3 2SD636R,S
Q4 2SB641R,S
Q5 DTC144ES
Q6 DTC144WS
Q7 DTA144WS
TP1
TP11 DRUM FF
TP25
TP GND
X1
CLOCK GEN
SYSTEM CLOCK
MODE DECODER
DRUM DISCR
DRUM APC DET
CAP APC DET
CAP DISCR
MIX AMP & CAP ERROR
REC
CAP FG COUNTER
FWD
REV
FIPFLOP REFERENCE COUNTER
RESET
DRUM FG SEP
DRUM PG SEP
SW PHASE MM
V PULSE MM
V PULSE GEN
V OSC COUNTER
V SYNC SEP
ON: ACCEPT
RST
LP DELAY MM
EP DELAY MM
0.5ms CNT
SP/LP DELAY MM
REC DUTY COUNTER
V PULSE CTL
TRACKING MM
CAP REF COUNTER
PB
REC ON
TEST
GND
Vcc
R79 SP SW POINT
R35 LP SW POINT
R46 LP TRACKING
D1 D2 D3 D7 D8 D10 MTZ12B D12 D13 MTZ5.1B D15 D16 D19 D20
CN4
DRUM ON
GND
CTL PULSE
REC START
SP
REV
PAUSE
SEARCH
VP ON
CAP FG
REC
NC
SWD 5V
DRUM FF
From/To 05 MOTHER CN8
CN3
MOTOR 12V
GND (M)
DRUM FG/PG
DRUM DRIVE
DRUM START
From/To 58 DRUM MOTOR CN1
CN5
UNREG 17V
V LOCK
SYNC
NC
TRACKING VR
NC
MOTOR 12V
NC
CAP DRIVE
V PULSE
ADJ PULSE
NC
CAP FG (+)
TRACKING FIX
CAP FG (−)
GND (M)
NC
From/To 05 MOTHER CN9
CN2
CAP FG
CAP FG
GND
SWD 5V
ADJ PULSE
From/To JIG UNIT
A B C D E F G H
1 2 3 4 5

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.18 SERVO CIRCUIT BOARD

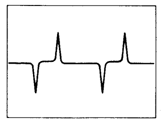
—Waveform of SERVO circuit—

1



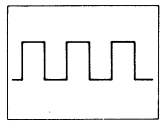
CN1-1
REC 8.0 Vp-p

2



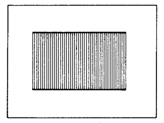
TP1
CTL PULSE
PB 1.4 Vp-p

3



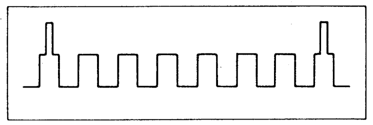
IC1-9
CAP FG
5.0 Vp-p

4



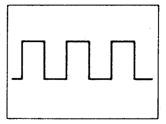
IC2-22
0.7 Vp-p

5



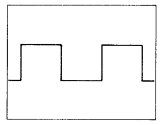
CN3-3
4.8 Vp-p

6



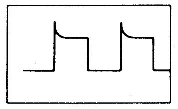
IC2-20
5.0 Vp-p

7

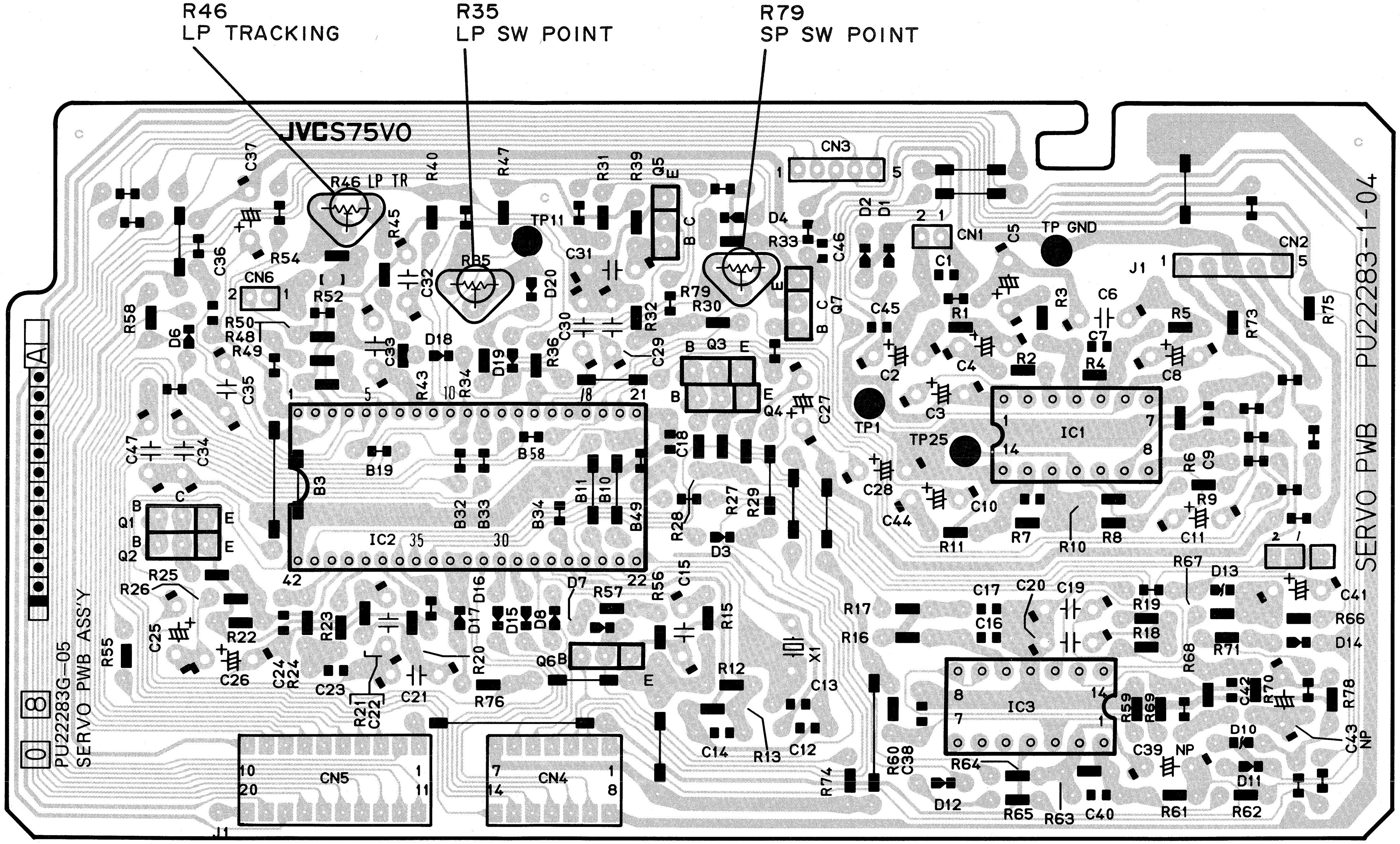


IC2-11
DRUM FF
4.3 Vp-p

8



IC2-2
4.5 Vp-p
(REC)



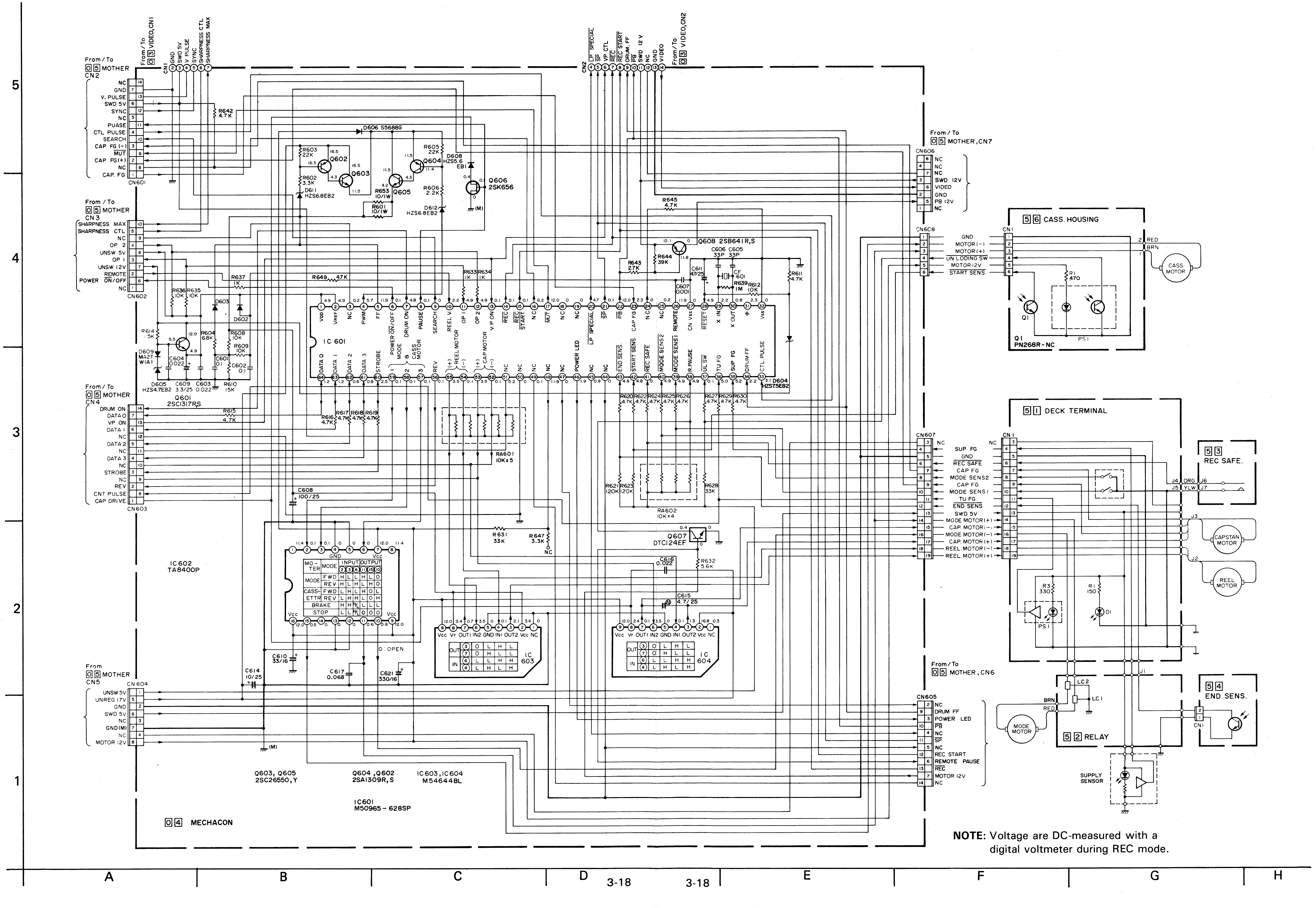
R46
LP TRACKING

R35
LP SW POINT

R79
SP SW POINT

JVC S75V0
PU22283-1-04
SERVO PWB
PU22283G-05
SERVO PWB ASS'Y
IC1
IC2
IC3
CN1
CN2
CN3
CN4
CN5
CN6
J1
TP1
TP11
TP25
TP GND
X1
Q1
Q2
Q3
Q4
Q5
Q6
Q7
R46 LP TR
R35
R79
A
0
8

3.19 MECHANISM CONTROL SCHEMATIC DIAGRAM

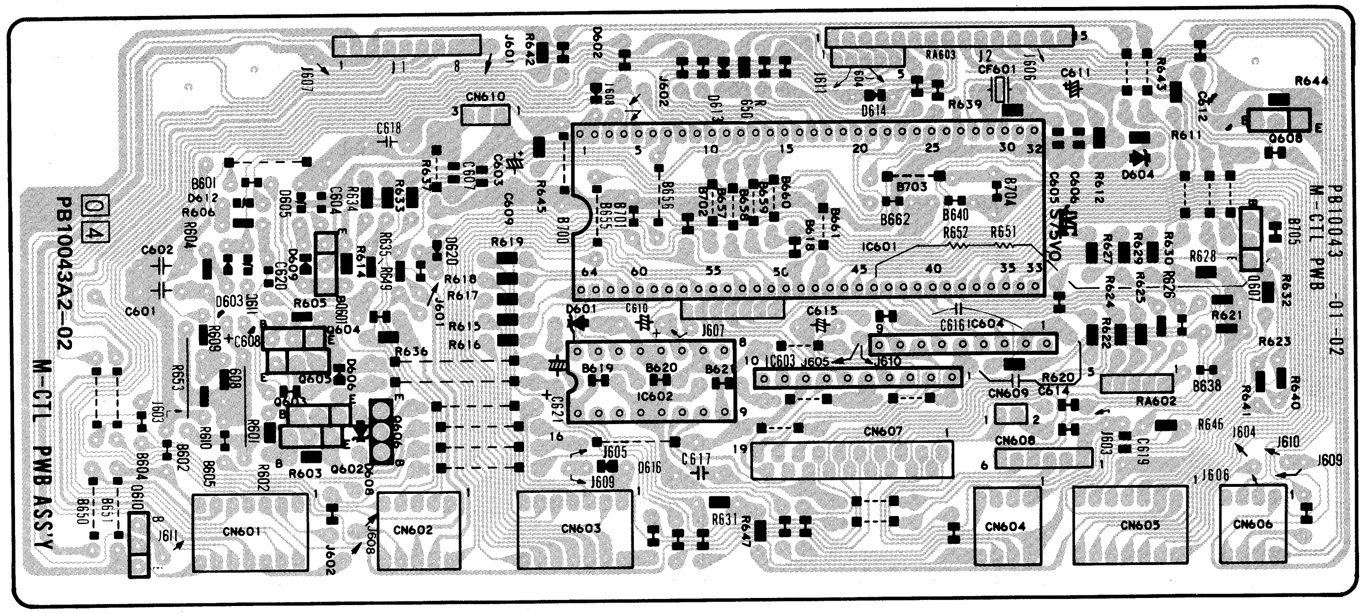


5
4
3
2
1
A
B
C
D
E
F
G
H
From / To
05 MOTHER
CN2
NC 14
GND 7
V. PULSE 13
SWD 5V 6
SYNC 12
NC 5
PUASE 11
CTL PULSE 4
SEARCH 10
CAP FG (–) 3
MUT 9
CAP FG(+) 2
NC 8
CAP. FG 1
CN601
From/To
03 VIDEO,CN1
CN1
GND
SWD 5V
V PULSE
SYNC
SHARPNESS CTL
SHARPNESS MAX
R642 4.7K
D606 S5688G
R603 22K
Q602
Q603
R602 3.3K
D611 HZS6.8EB2
R653 10/1W
Q605
R601 10/1W
R605 22K
Q604
D608 HZS5.6 EB1
R606 2.2K
D612 HZS6.8EB2
Q606 2SK656
(M)
From / To
05 MOTHER
CN3
SHARPNESS MAX 10
SHARPNESS CTL 5
NC 9
OP 2 4
UNSW 5V 8
OP 1 3
UNSW 12V 7
REMOTE 2
POWER ON/OFF 6
NC 1
CN602
R637 1K
R649 47K
R633 1K
R634 1K
R636 10K
R635 10K
D603
D602
R614 5K
Q601 2SC1317RS
R604 68K
R608 10K
R609 10K
C601 0.1
C602 0.1
D609 MA27 W(A)
C604 .0022
D605 HZS4.7EB2
C609 3.3/25
C603 0.022
R610 15K
IC 601
VDD
VREF
NC
PWM
FF
POWER ON/OFF
DRUM ON
PAUSE
SEARCH
REEL V
OP 1
OP 2
V.P ON
REC
REC START
NC
MUT
NC
NC
LP SPECIAL
SP
PB
CAP FG
NC
NC
REMOTE
CN Vss
RESET
X IN
X OUT
φ
Vss
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
MODE & CASS MOTOR
REV
REEL MOTOR (+) (–)
CAP MOTOR (+) (–)
NC
POWER LED
END SENS
START SENS
REC SAFE
MODE SENS2
MODE SENS1
R.PAUSE
UL SW
TU FG
SUP FG
DRUM FF
CTL PULSE
D604 HZS7.5EB2
From/To
05 VIDEO,CN2
CN2
LP SPECIAL
SP
VP CTL
REC
REC START
DRUM FF
PB
SWD 12 V
NC
GND
VIDEO
R645 4.7K
Q608 2SB641R,S
R644 39K
R643 27K
C611 47/25
C606 33P
C605 33P
CF 601
C607 0.001
R639 1M
R612 10K
R611 4.7K
R620 4.7K
R622 4.7K
R624 4.7K
R625 4.7K
R626 4.7K
R627 4.7K
R629 4.7K
R630 4.7K
R621 120K
R623 120K
R628 33K
RA602 10K×4
From / To
05 MOTHER
CN4
DRUM ON 14
DATA 0 7
VP ON 13
DATA 1 6
NC 12
DATA 2 5
NC 11
DATA 3 4
NC 10
STROBE 3
NC 9
REV 2
CNT PULSE 8
CAP DRIVE 1
CN603
R615 4.7K
R616 4.7K
R617 4.7K
R618 4.7K
R619 4.7K
RA601 10K×5
C608 100/25
R631 33K
R647 3.3K
NC
Q607 DTC124EF
C616 0.022
R632 5.6K
C615 4.7/25
IC602 TA8400P
GND
Vcc
MO-TER | MODE | INPUT ② ③ ⑥ | OUTPUT ⑪ ⑮ ⑩
MODE FWD | H L L | H L O
MODE REV | H L H | L H O
CASS-ETTR FWD | L H L | H O L
CASS-ETTR REV | L H H | L O H
BRAKE | H H H/L | L L L
STOP | L L H/L | O O O
O : OPEN
C610 33/16
C617 0.068
C621 330/16
C614 10/25
Vcc Vr OUT1 IN2 GND IN1 OUT2 Vcc NC
OUT ③ | O L H L
OUT ⑦ | O H L L
IN ⑥ | L L H H
IN ④ | L H L H
IC 603
IC 604
From
05 MOTHER
CN5
CN604
UNSW 5V 1
UNREG 17V 5
GND 2
SWD 5V 6
NC 3
GND(M) 7
NC 4
MOTOR 12V 8
(M)
Q603, Q605 2SC26550,Y
Q604, Q602 2SA1309R,S
IC603, IC604 M54644BL
IC601 M50965-628SP
04 MECHACON
From / To
05 MOTHER,CN7
CN606
NC 8
NC 4
NC 7
SWD 12V 3
VIDEO 6
GND 2
PB 12V 5
NC 1
CN608
GND
MOTOR (–)
MOTOR (+)
UN LODING SW
MOTOR 12V
START SENS.
56 CASS. HOUSING
CN1
RED
BRN
CASS. MOTOR
R1 470
Q1
PS1
Q1 PN268R-NC
51 DECK TERMINAL
CN607
CN1
NC
SUP FG
GND
REC SAFE
CAP FG
MODE SENS2
CAP FG
MODE SENS1
TU FG
END SENS
SWD 5V
MODE MOTOR(+)
CAP. MOTOR(–)
MODE MOTOR(–)
CAP. MOTOR(+)
REEL MOTOR(–)
REEL MOTOR(+)
53 REC SAFE.
J4 ORG J6
J5 YLW J7
J3
CAPSTAN MOTOR
J2
REEL MOTOR
R3 330
PS1
R1 150
D1
From / To
05 MOTHER, CN6
CN605
NC
DRUM FF
POWER LED
PB
NC
SP
NC
REC START
REMOTE PAUSE
REC
MOTOR 12V
NC
LC2
LC1
BRN
RED
MODE MOTOR
52 RELAY
J1
54 END SENS.
CN1
SUPPLY SENSOR

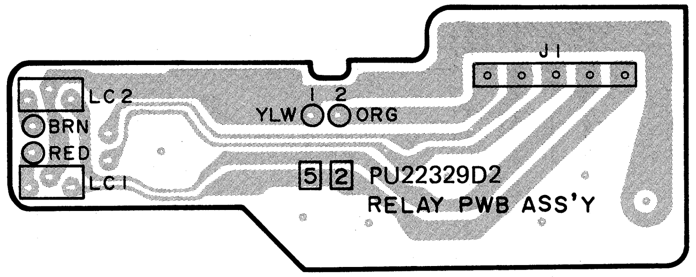
NOTE: Voltage are DC-measured with a digital voltmeter during REC mode.

3.20 MECHANISM CONTROL AND DECK TERMINAL, CASSETTE HOUSING CIRCUIT BOARDS

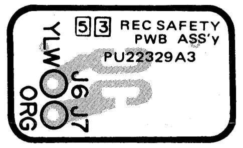
—MECHANISM CONTROL—


0 4
PB10043A2-02
M-CTL PWB ASS'Y
PB10043 -01-02
M-CTL PWB
IC601
IC602
IC603
IC604
CN601
CN602
CN603
CN604
CN605
CN606
CN607
CN608
CN609
CN610

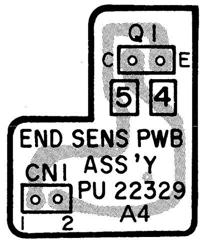
—RELAY—


LC2
BRN
RED
LC1
J1
1 2
YLW ORG
5 2 PU22329D2
RELAY PWB ASS'Y

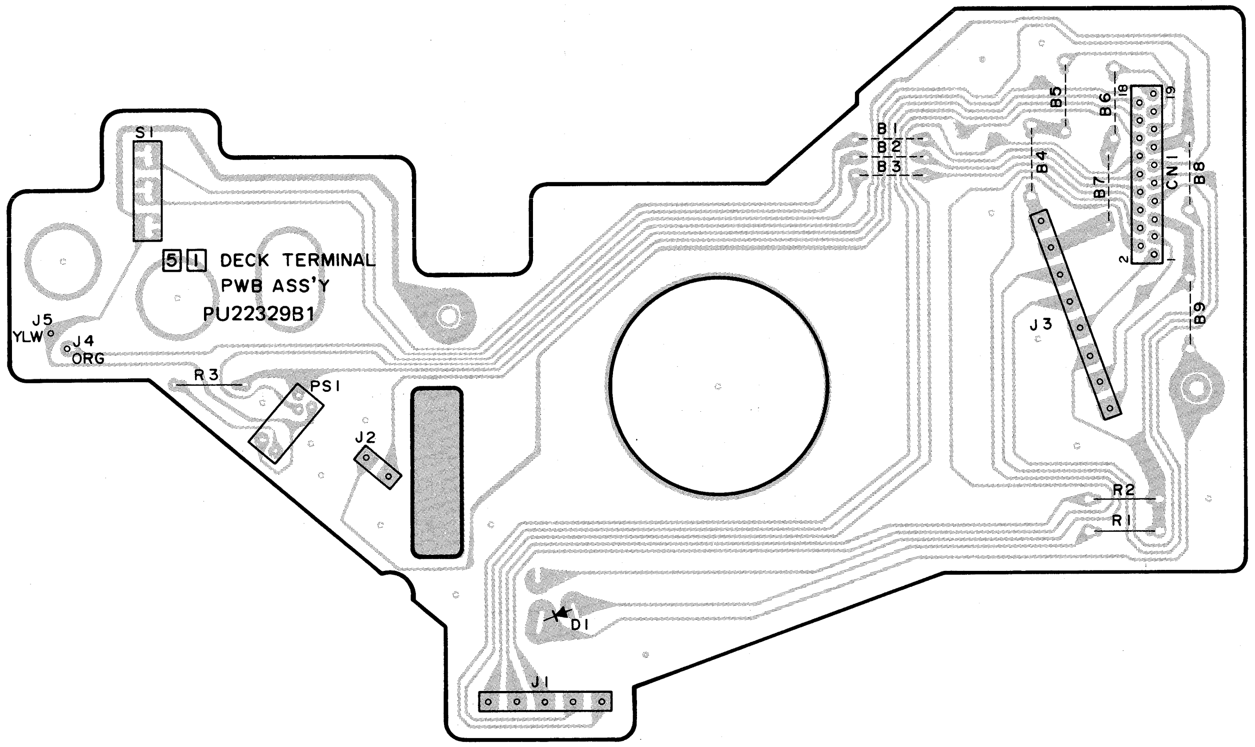
—REC SAFETY—


5 3 REC SAFETY PWB ASS'Y
PU22329A3
YLW
ORG
J6
J7

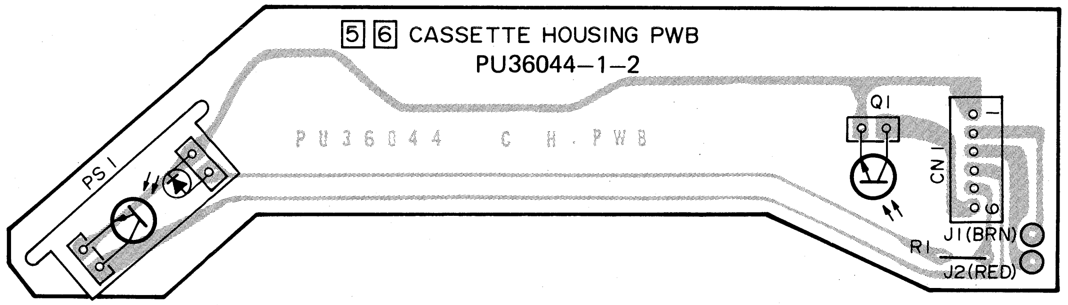
—END SENSOR—


Q1
C E
5 4
END SENS PWB ASS'Y
CN1
PU 22329 A4
1 2

—DECK TERMINAL—


S1
5 1 DECK TERMINAL PWB ASS'Y
PU22329B1
J5
YLW
J4
ORG
R3
PS1
J2
D1
J1
B1
B2
B3
B4
B5
B6
B7
B8
B9
CN1
J3
R2
R1

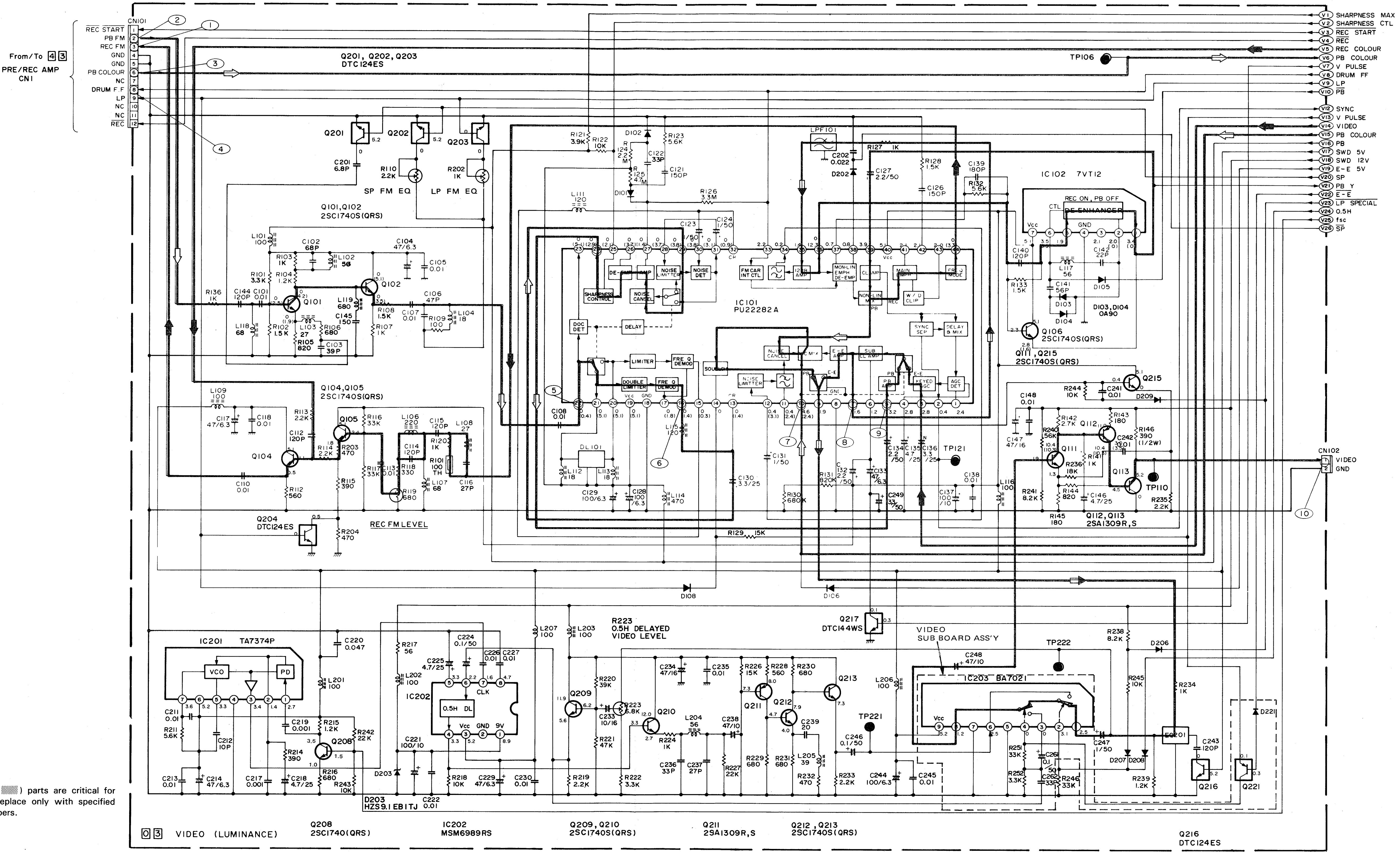
—CASSETTE HOUSING—


5 6 CASSETTE HOUSING PWB
PU36044-1-2
PU36044 C.H.PWB
PS1
Q1
CN1
R1
J1(BRN)
J2(RED)

5
4
3
2
1

A B C D E F G H

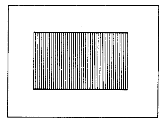
3.21 VIDEO (LUMINANCE) SCHEMATIC DIAGRAM


CN101
REC START 1
PB FM 2
REC FM 3
GND 4
GND 5
PB COLOUR 6
NC 7
DRUM F F 8
LP 9
NC 10
NC 11
REC 12
From/To 4 3
PRE/REC AMP
CN1
Q201, Q202, Q203
DTC124ES
Q201
Q202
Q203
C201 6.8P
R110 2.2K
R202 1K
SP FM EQ
LP FM EQ
Q101,Q102
2SC1740S(QRS)
L101 100
C102 68P
L102 56
C104 47/6.3
C105 0.01
R103 1K
R104 1.2K
R101 3.3K
Q101
Q102
R136 1K
C144 120P
C101 0.01
L119 680
C145 150
C106 47P
L104 18
R108 1.5K
C107 0.01
R109 100
R107 1K
L118 68
R102 1.5K
L103 27
R106 680
R105 820
C103 39P
Q104,Q105
2SC1740S(QRS)
L109 100
C117 47/6.3
C118 0.01
R113 2.2K
C112 120P
Q105
R116 33K
L106 220
C115 120P
L108 27
C114 120P
R120 1K
R114 2.2K
R203 470
R117 33K
C113 0.01
R118 330
R101 100 TH
L107 68
C116 27P
Q104
C110 0.01
R112 560
R115 390
R119 680
Q204
DTC124ES
R204 470
REC FM LEVEL
R121 3.9K
R122 10K
D102
R123 5.6K
R124 2.2 M
C122 33P
R125 4.7M
C121 150P
D101
R126 3.3M
L111 120
C123 1/50
C124 1/50
LPF101
C202 0.022
D202
R127 1K
C127 2.2/50
R128 1.5K
C139 180P
C126 150P
R132 5.6K
IC102 7VT12
REC ON, PB OFF
DE-ENHANCER
CTL
Vcc
GND
C140 120P
C142 22P
L117 56
R133 1.5K
C141 56P
D103
D105
D104
D103,D104
OA90
Q106
2SC1740S(QRS)
Q111, Q215
2SC1740S(QRS)
DE-EMP
AMP
NOISE LIMITER
NOISE DET
SHARPNESS CONTROL
NOISE CANCEL
FM CAR INT CTL
12dB AMP
NON-LIN EMPH DE-EMP
CLAMP
MAIN EMPH
FREQ MODE
NON-LIN
W/D CLIP
IC101
PU22282A
DOC DET
DELAY
LIMITER
FREQ DEMOD
DOUBLE LIMITER
SOURCE
NOISE LIMITER
NL/IL CANCEL
E-E AMP
SUB CLAMP
SYNC SEP
DELAY & MIX
PB AMP
KEYED AGC
AGC DET
C108 0.01
DL101
L112 18
L113 18
C129 100/6.3
C128 100/6.3
L114 470
L115 120
C130 3.3/25
C131 1/50
R130 680K
R131 820K
C132 2.2/50
C133 47/6.3
C134 2.2/50
C135 47/25
C136 3.3/25
TP121
C138 0.01
C137 100/10
C249 33/50
L116 100
R129 15K
R244 10K
C241 0.01
Q215
D209
C148 0.01
R142 2.7K
Q112
R143 180
R146 390 (1/2W)
C147 47/16
R240 56K
Q111
R141 1K
C242 0.01
R236 18K
Q113
TP110
R241 8.2K
R144 820
C146 4.7/25
R235 2.2K
R145 180
Q112,Q113
2SA1309R,S
CN102
VIDEO
GND
TP106
D108
D106
Q217
DTC144WS
VIDEO SUB BOARD ASS'Y
TP222
R238 8.2K
D206
IC201 TA7374P
VCO
PD
C211 0.01
R211 5.6K
C212 10P
C219 0.001
R215 1.2K
R214 390
Q208
R242 22K
C213 0.01
C214 47/6.3
C217 0.001
C218 4.7/25
R216 680
R243 10K
C220 0.047
L201 100
R217 56
C225 4.7/25
C224 0.1/50
C226 0.01
C227 0.01
L202 100
IC202
0.5H DL
CLK
Vcc GND 9V
C221 100/10
D203
R218 10K
C229 47/6.3
C230 0.01
C222 0.01
D203
HZS9.1EB1TJ
L207 100
L203 100
R223
0.5H DELAYED
VIDEO LEVEL
Q209
R220 39K
C233 10/16
R223 6.8K
Q210
C234 47/16
C235 0.01
R226 15K
R228 560
R230 680
Q213
Q211
Q212
R221 47K
R224 1K
L204 56
C238 47/10
C239 20
C236 33P
C237 27P
R227 22K
R229 680
R231 680
L205 39
R219 2.2K
R222 3.3K
R232 470
R233 2.2K
TP221
C246 0.1/50
C244 100/6.3
C245 0.01
L206 100
C248 47/10
IC203 BA7021
Vcc
R251 33K
R252 3.3K
C261 0.1
C262 33P
R246 33K
C247 1/50
D207
D208
R245 10K
R234 1K
SW201
C243 120P
D221
R239 1.2K
Q216
Q221
0 3 VIDEO (LUMINANCE)
Q208
2SC1740(QRS)
IC202
MSM6989RS
Q209,Q210
2SC1740S(QRS)
Q211
2SA1309R,S
Q212,Q213
2SC1740S(QRS)
Q216
DTC124ES
V1 SHARPNESS MAX
V2 SHARPNESS CTL
V3 REC START
V4 REC
V5 REC COLOUR
V6 PB COLOUR
V7 V PULSE
V8 DRUM FF
V9 LP
V10 PB
V12 SYNC
V13 V PULSE
V14 VIDEO
V15 PB COLOUR
V16 PB
V17 SWD 5V
V18 SWD 12V
V19 E-E 5V
V20 SP
V21 PB Y
V22 E-E
V23 LP SPECIAL
V24 0.5H
V25 fsc
V26 SP
①
②
③
④
⑤
⑥
⑦
⑧
⑨
⑩

NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

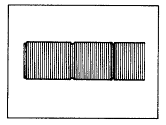
—Waveforms of VIDEO circuit—

1



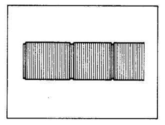
CN101-3
REC FM
0.06 Vp-p

2



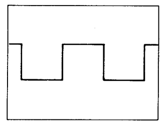
CN101-2
PB FM
PB 0.45 Vp-p

3



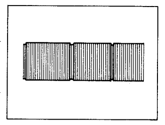
CN101-6
PB FM
PB 0.45 Vp-p

4



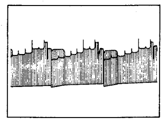
CN101-8
DRUM FF
4.4 Vp-p

5



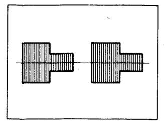
IC101-22
PB FM
0.3 Vp-p

6



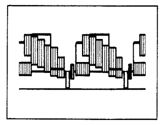
IC101-16
PB 0.4 Vp-p

7



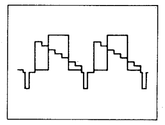
IC101-10
PB 0.4 Vp-p

8



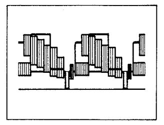
IC101-7
REC 0.56 Vp-p

9



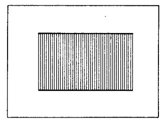
101-5
PB 0.22 Vp-p

10



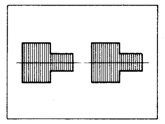
CN102-1
VIDEO OUT
2.0 Vp-p

11



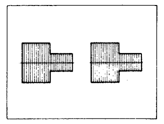
TP306
VXO
0.5 Vp-p

12



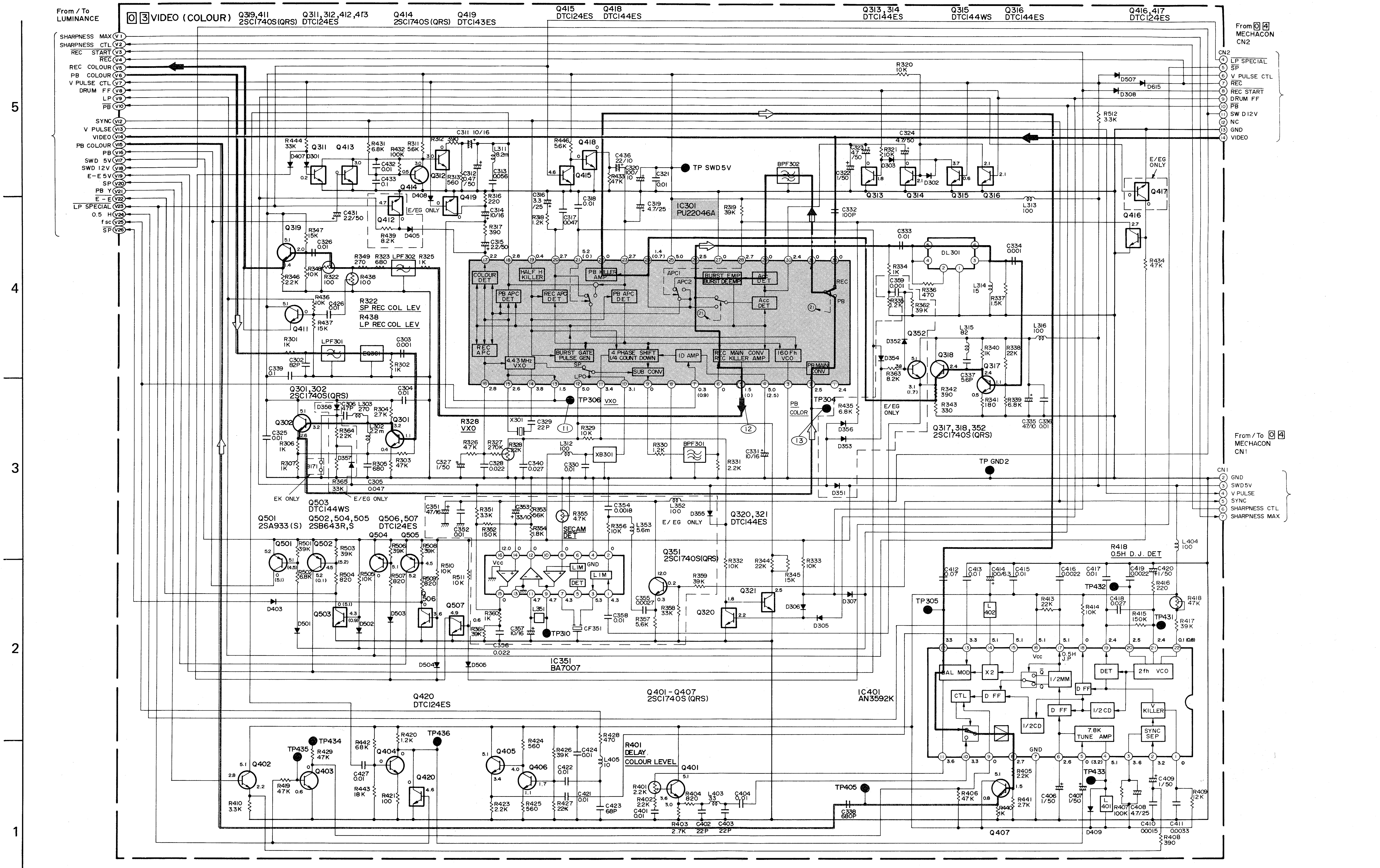
IC301-5
REC 1.0 Vp-p

13



TP304
PB COLOUR
0.2 Vp-p

3.22 VIDEO (COLOR) SCHEMATIC DIAGRAM

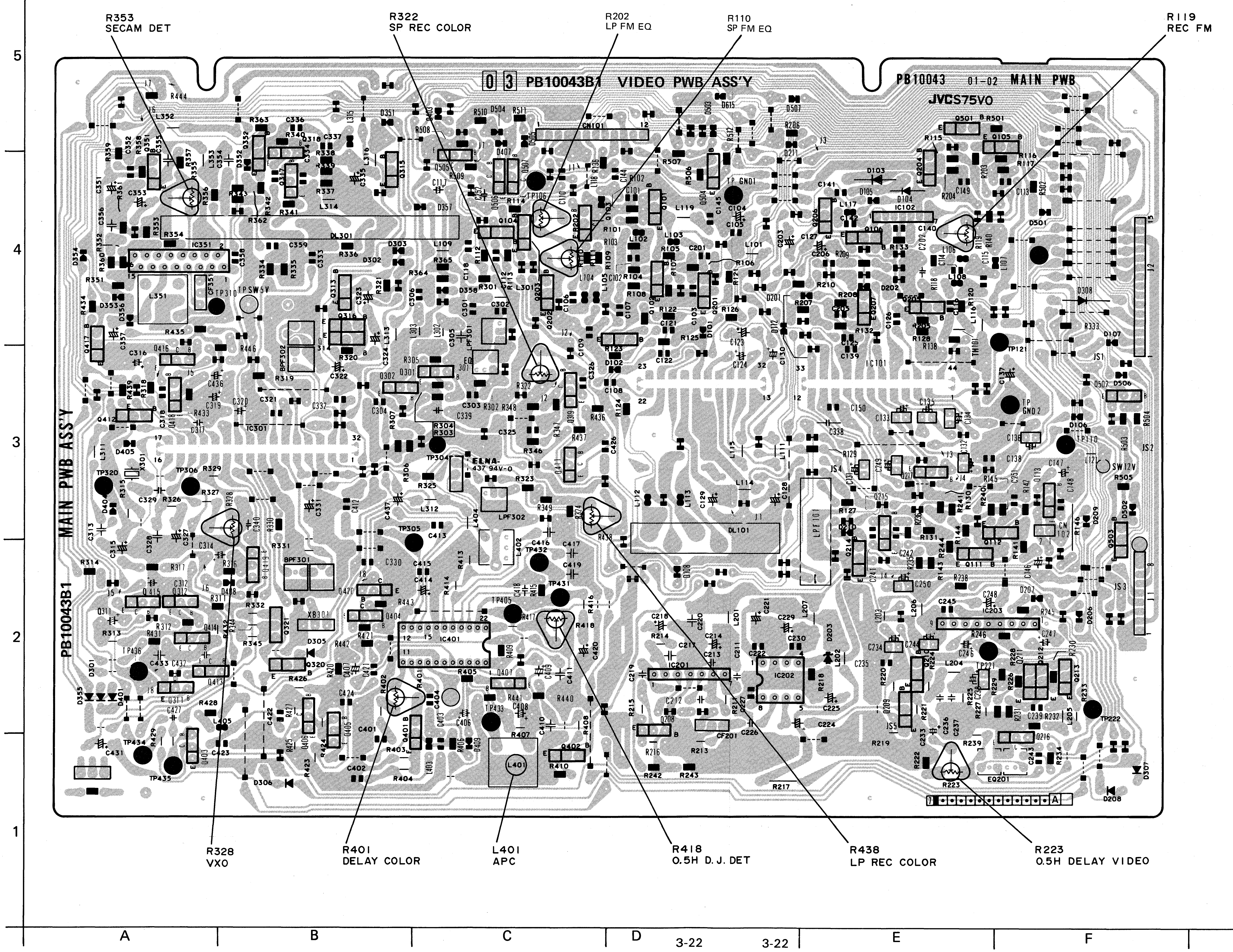


From / To LUMINANCE
03 VIDEO (COLOUR)
Q319,411 2SC1740S(QRS)
Q311,312,412,413 DTC124ES
Q414 2SC1740S(QRS)
Q419 DTC143ES
Q415 DTC124ES
Q418 DTC144ES
Q313,314 DTC144ES
Q315 DTC144WS
Q316 DTC144ES
Q416,417 DTC124ES
SHARPNESS MAX
SHARPNESS CTL
REC START
REC
REC COLOUR
PB COLOUR
V PULSE CTL
DRUM FF
LP
PB
SYNC
V PULSE
VIDEO
PB COLOUR
PB
SWD 5V
SWD 12V
E-E 5V
SP
PB Y
E-E
LP SPECIAL
0.5 H
fsc
SP
From 04 MECHACON CN2
LP SPECIAL
SP
V PULSE CTL
REC
REC START
DRUM FF
PB
SW D12V
NC
GND
VIDEO
E/EG ONLY
TP SWD5V
IC301 PU22046A
COLOUR DET
HALF H KILLER
PB KILLER AMP
APC1
APC2
BURST EMP BURST DEEMP
ACC DET
PB APC DET
REC APC DET
PB APC DET
Acc DET
REC APC
4.43 MHz VXO
BURST GATE PULSE GEN
4 PHASE SHIFT 1/4 COUNT DOWN
SUB CONV
ID AMP
REC MAIN CONV REC KILLER AMP
160 Fh VCO
PB MAIN CONV
R322 SP REC COL LEV
R438 LP REC COL LEV
Q301,302 2SC1740S(QRS)
R328 VXO
TP306 VXO
TP304
DL301
Q317,318,352 2SC1740S(QRS)
TP GND2
From / To 04 MECHACON CN1
GND
SWD5V
V PULSE
SYNC
SHARPNESS CTL
SHARPNESS MAX
EK ONLY
E/EG ONLY
Q503 DTC144WS
Q501 2SA933(S)
Q502,504,505 2SB643R,S
Q506,507 DTC124ES
SECAM DET
Q320,321 DTC144ES
Q351 2SC1740S(QRS)
IC351 BA7007
TP310
Q420 DTC124ES
Q401-Q407 2SC1740S(QRS)
IC401 AN3592K
R418 0.5H D.J. DET
TP432
TP305
TP431
TP433
TP405
BAL MOD
X2
1/2MM
DET
2fH VCO
CTL
D FF
1/2CD
V KILLER
7.8K TUNE AMP
SYNC SEP
TP434
TP435
TP436
R401 DELAY COLOUR LEVEL
5
4
3
2
1
A
B
C
D
E
F
G
H

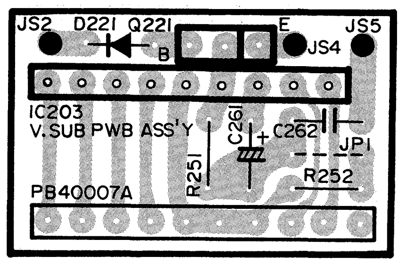
NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

3.23 VIDEO CIRCUIT BOARD

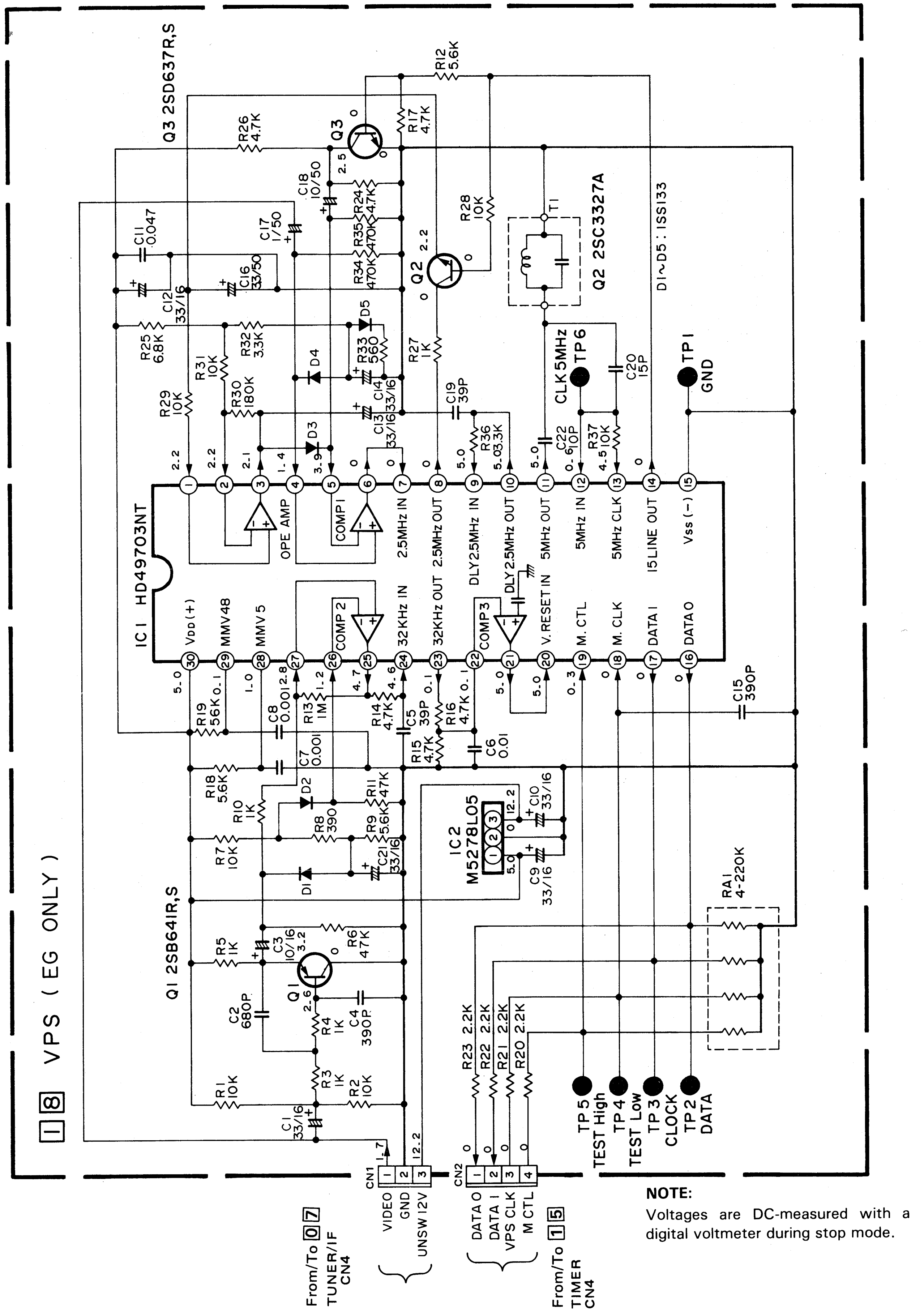
– VIDEO –


R353
SECAM DET
R322
SP REC COLOR
R202
LP FM EQ
R110
SP FM EQ
R119
REC FM
PB10043B1 VIDEO PWB ASS'Y
PB10043 01-02 MAIN PWB
JVCS75V0
MAIN PWB ASS'Y
PB10043B1
R328
VXO
R401
DELAY COLOR
L401
APC
R418
0.5H D. J. DET
R438
LP REC COLOR
R223
0.5H DELAY VIDEO
5
4
3
2
1
A
B
C
D
E
F
G
H

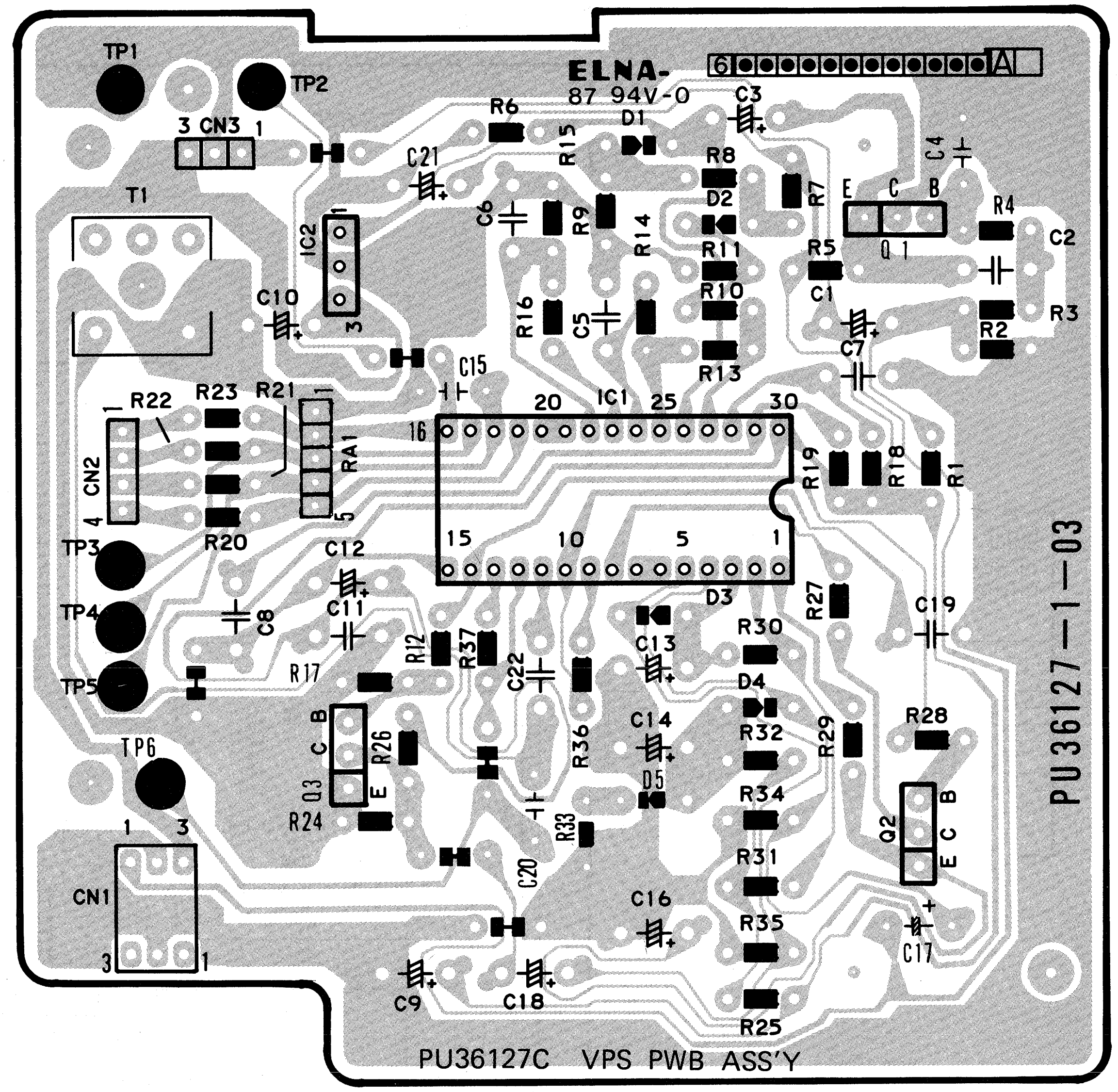
– VIDEO SUB –


JS2
D221
Q221
E
B
JS4
JS5
IC203
V.SUB PWB ASS'Y
C261
C262
JP1
R251
R252
PB40007A

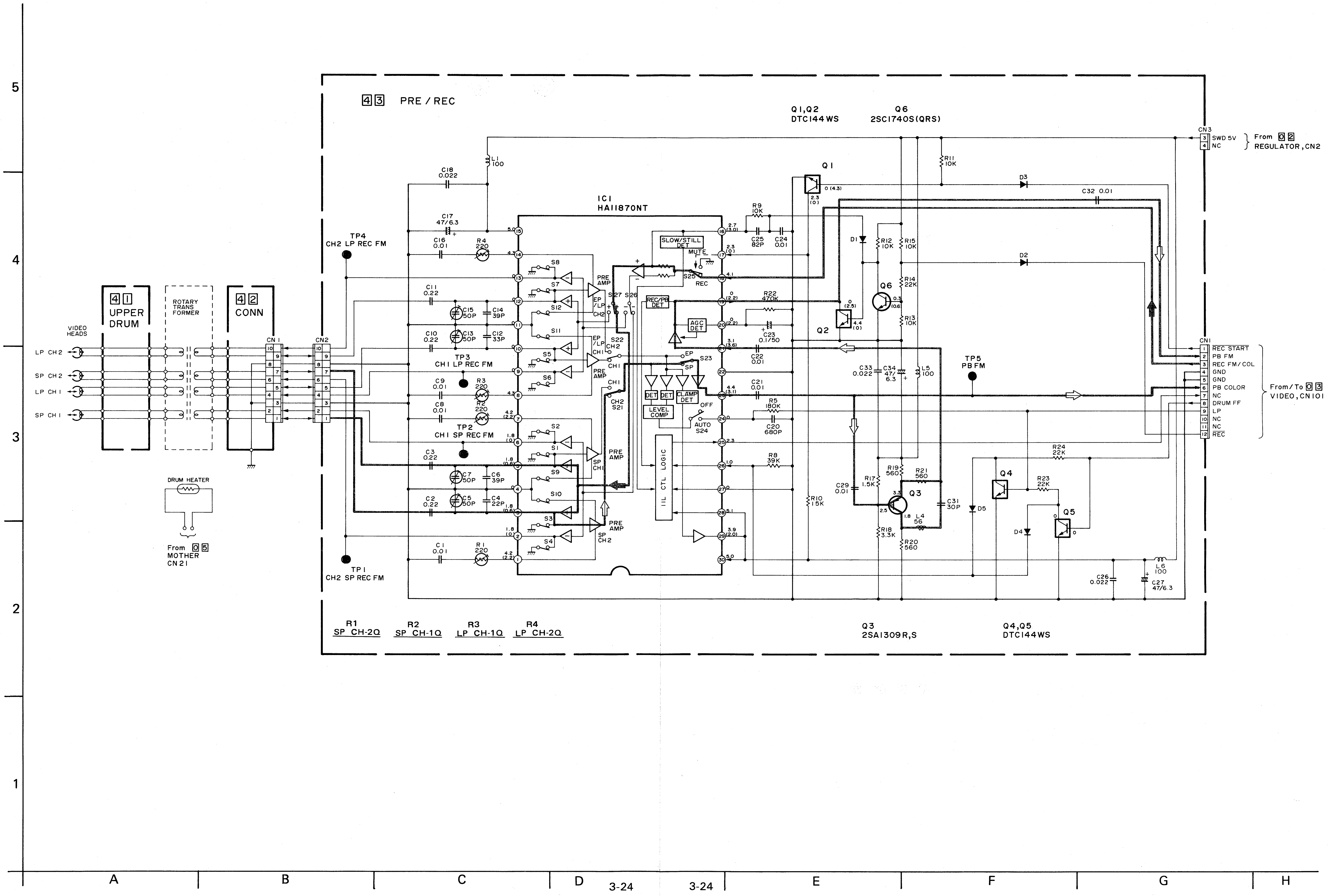
3.24 VPS SCHEMATIC DIAGRAM AND CIRCUIT BOARD (EG ONLY)


18 VPS (EG ONLY)
IC1 HD49703NT
IC2 M5278L05
Q1 2SB641R,S
Q2 2SC3327A
Q3 2SD637R,S
D1~D5 : 1SS133
T1
TP1 GND
CLK 5MHz TP6
TP5 TEST High
TP4 TEST Low
TP3 CLOCK
TP2 DATA
RA1 4-220K
OPE AMP
COMP1
COMP2
COMP3
2.5MHz IN
2.5MHz OUT
DLY2.5MHz IN
DLY2.5MHz OUT
5MHz OUT
5MHz IN
5MHz CLK
15LINE OUT
Vss (-)
VDD (+)
MMV48
MMV5
32KHz IN
32KHz OUT
V.RESET IN
M. CTL
M. CLK
DATA I
DATA O
CN1
VIDEO
GND
UNSW 12V
From/To 07 TUNER/IF CN4
CN2
DATA O
DATA I
VPS CLK
M CTL
From/To 15 TIMER CN4
R1 10K
R2 10K
R3 1K
R4 1K
R5 1K
R6 47K
R7 10K
R8 390
R9 5.6K
R10 1K
R11 47K
R12 5.6K
R13 1M
R14 4.7K
R15 4.7K
R16 4.7K
R17 4.7K
R18 5.6K
R19 56K
R20 2.2K
R21 2.2K
R22 2.2K
R23 2.2K
R24 47K
R25 6.8K
R26 4.7K
R27 1K
R28 10K
R29 10K
R30 180K
R31 10K
R32 3.3K
R33 560
R34 470K
R35 470K
R36 3.3K
R37 10K
C1 33/16
C2 680P
C3 10/16
C4 390P
C5 39P
C6 0.01
C7 0.001
C8 0.001
C9 33/16
C10 33/16
C11 0.047
C12 33/16
C13 33/16
C14 33/16
C15 390P
C16 33/50
C17 1/50
C18 10/50
C19 39P
C20 15P
C21 33/16
C22 10P

NOTE:
Voltages are DC-measured with a digital voltmeter during stop mode.


ELNA-
87 94V-0
PU36127-1-03
PU36127C VPS PWB ASS'Y
TP1
TP2
TP3
TP4
TP5
TP6
CN1
CN2
CN3
T1
IC1
IC2
Q1
Q2
Q3
RA1
E C B

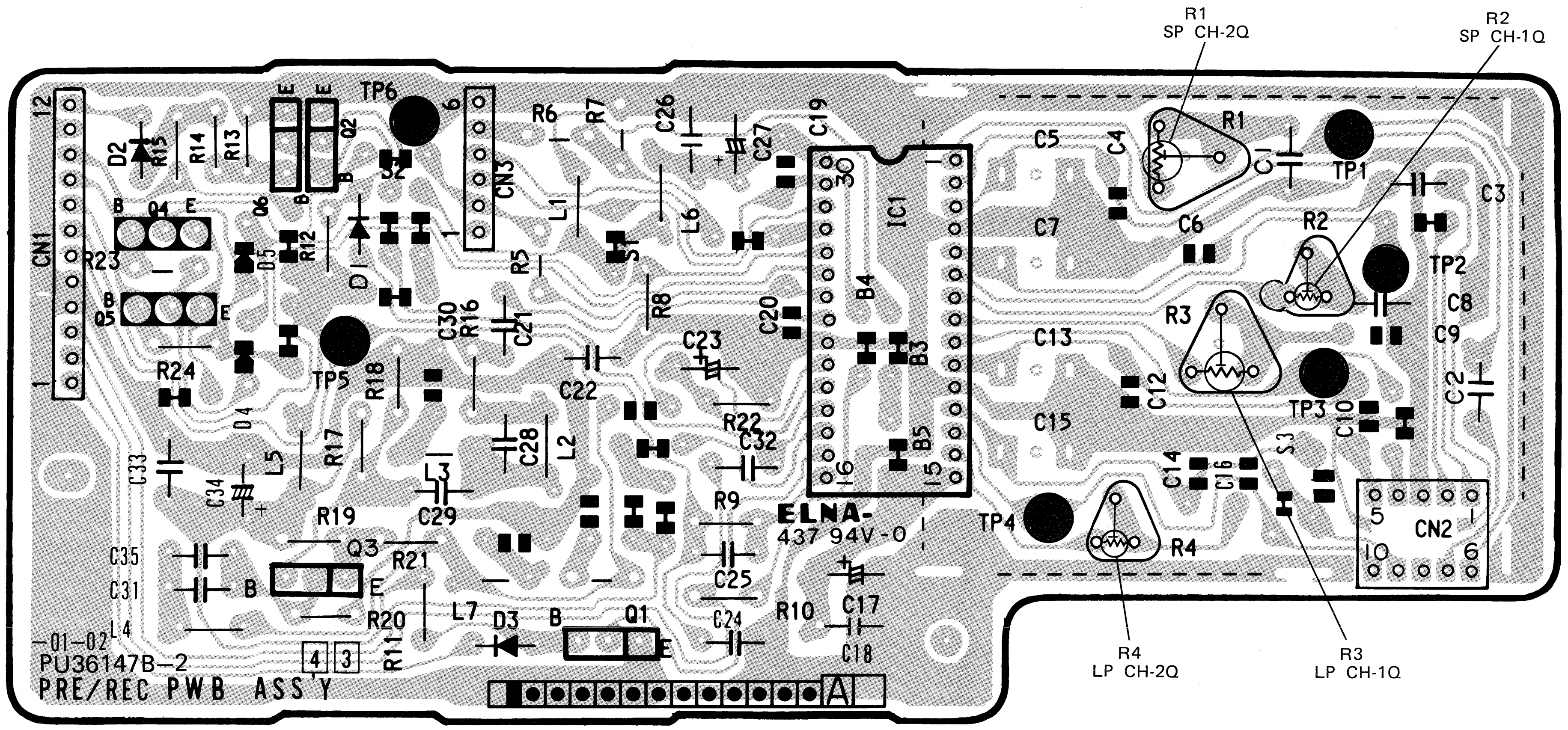
3.25 PRE/REC SCHEMATIC DIAGRAM



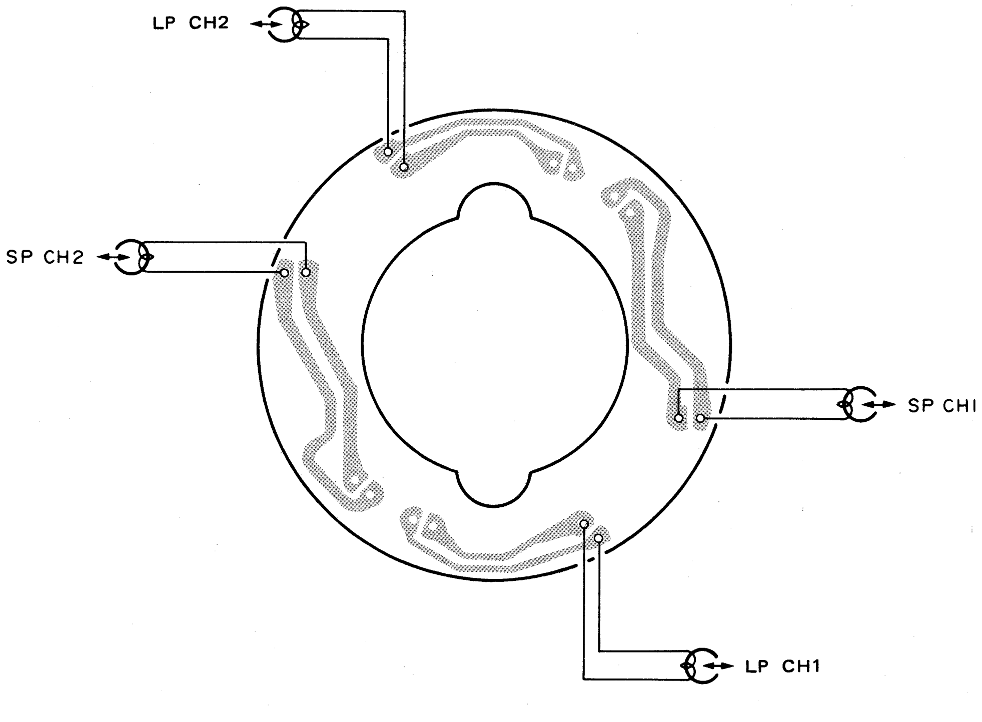
43 PRE / REC
41 UPPER DRUM
ROTARY TRANS FORMER
42 CONN
VIDEO HEADS
LP CH2
SP CH2
LP CH1
SP CH1
CN1
CN2
DRUM HEATER
From 05 MOTHER CN21
TP4 CH2 LP REC FM
TP3 CH1 LP REC FM
TP2 CH1 SP REC FM
TP1 CH2 SP REC FM
TP5 PB FM
IC1 HA11870NT
SLOW/STILL DET
MUTE
REC/PB DET
AGC DET
DET
DET
CLAMP DET
LEVEL COMP
IIL CTL LOGIC
PRE AMP
EP/LP CH2
EP/LP CH1
SP CH1
SP CH2
REC
EP
SP
OFF
AUTO S24
Q1,Q2 DTC144WS
Q6 2SC1740S(QRS)
Q3 2SA1309R,S
Q4,Q5 DTC144WS
L1 100
C18 0.022
C17 47/6.3
C16 0.01
R4 220
C11 0.22
C15 50P
C14 39P
C10 0.22
C13 50P
C12 33P
C9 0.01
R3 220
C8 0.01
R2 220
C3 0.22
C7 50P
C6 39P
C2 0.22
C5 50P
C4 22P
C1 0.01
R1 220
R9 10K
C25 82P
C24 0.01
R22 470K
C23 0.1/50
C22 0.01
C21 0.01
R5 180K
C20 680P
R8 39K
R10 1.5K
R11 10K
R12 10K
R15 10K
R14 22K
R13 10K
D1
D2
D3
C32 0.01
C33 0.022
C34 47/6.3
L5 100
C29 0.01
R17 1.5K
R19 560
R21 560
R18 3.3K
L4 56
R20 560
C31 30P
D5
D4
R24 22K
R23 22K
C26 0.022
L6 100
C27 47/6.3
CN3
SWD 5V
NC
From 02 REGULATOR, CN2
REC START
PB FM
REC FM/COL
GND
GND
PB COLOR
NC
DRUM FF
LP
NC
NC
REC
From/To 03 VIDEO, CN101
R1 SP CH-2Ω
R2 SP CH-1Ω
R3 LP CH-1Ω
R4 LP CH-2Ω
1
2
3
4
5
A
B
C
D
E
F
G
H

3.26 PRE/REC AND UPPER DRUM CIRCUIT BOARDS

—PRE/REC—

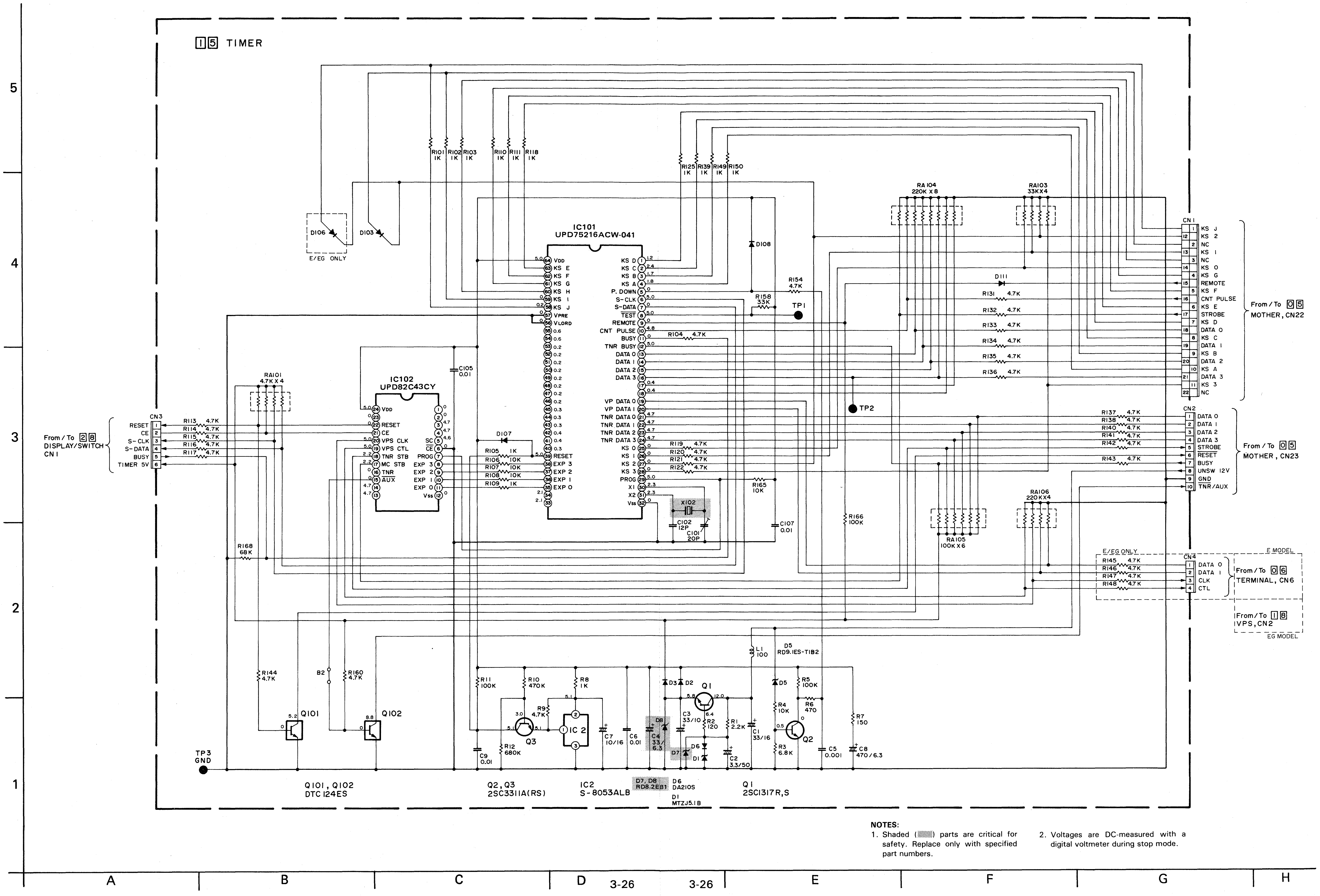

R1
SP CH-2Ω
R2
SP CH-1Ω
CN1
12
1
D2
R15
R14
R13
Q4
Q5
Q6
Q2
Q3
Q1
R23
R24
D5
D1
D4
D3
R12
S2
TP6
TP5
TP4
TP3
TP2
TP1
CN3
6
1
R6
R7
R5
L1
L6
S1
R8
C26
C27
C19
C20
C21
C30
R16
R18
R17
L5
L2
L3
L4
L7
C22
C23
R22
C32
C28
C29
C33
C34
C35
C31
R19
R21
R20
R11
R9
C25
C24
R10
C17
C18
IC1
30
1
B4
B3
B5
16
15
ELNA-
437 94V-0
C5
C4
C1
C3
C7
C6
R1
R2
R3
R4
C8
C9
C13
C12
C15
C14
C16
S3
C10
C2
CN2
5
1
10
6
-01-02
PU36147B-2
PRE/REC PWB ASS'Y
4 3
A
R4
LP CH-2Ω
R3
LP CH-1Ω

—UPPER DRUM—


LP CH2
SP CH2
SP CH1
LP CH1

4 1 UPPER BOARD PWB
PDM3018

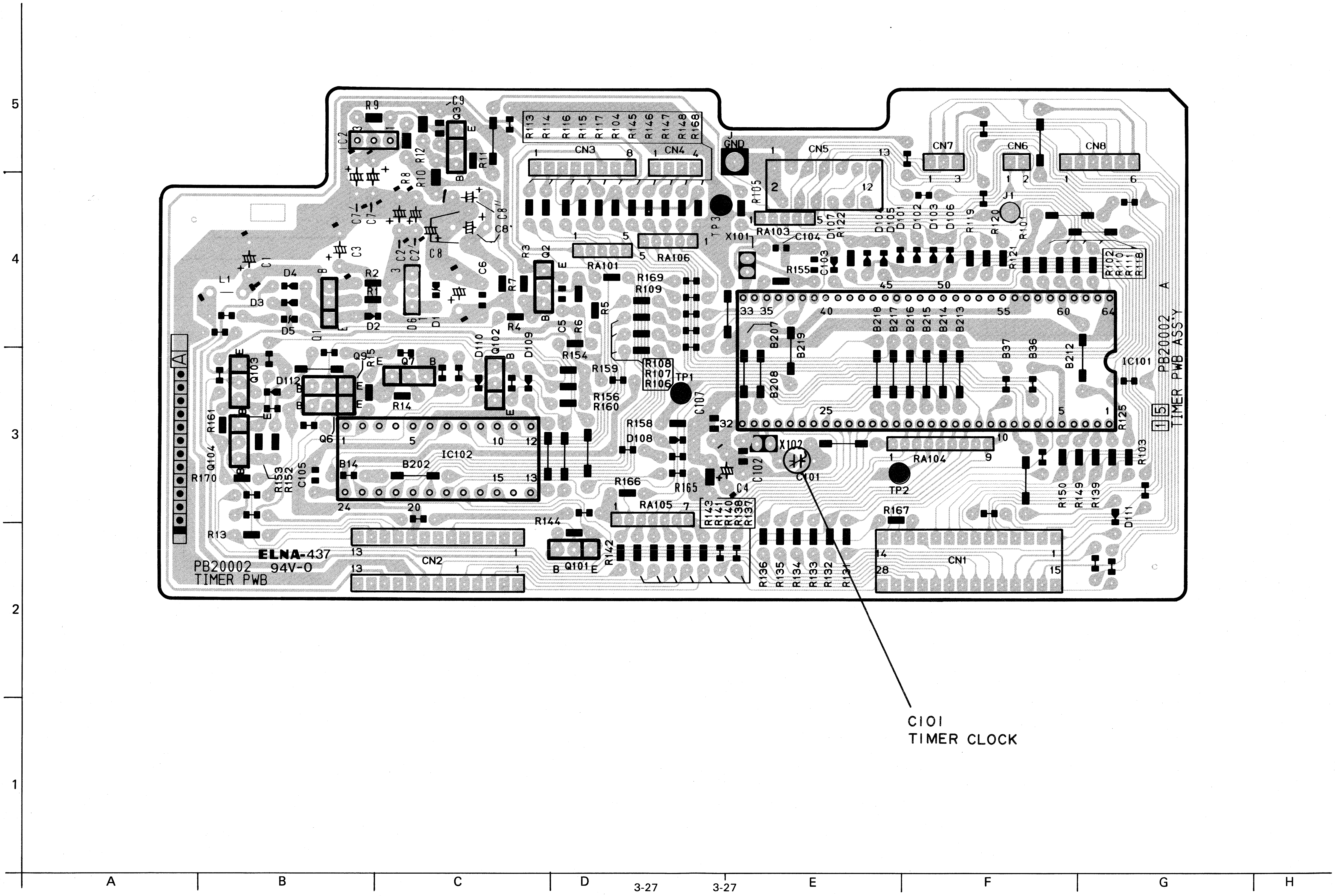
3.27 TIMER SCHEMATIC DIAGRAM


15 TIMER
IC101
UPD75216ACW-041
IC102
UPD82C43CY
VDD
KS E
KS F
KS G
KS H
KS I
KS J
VPRE
VLORD
KS D
KS C
KS B
KS A
P. DOWN
S-CLK
S-DATA
TEST
REMOTE
CNT PULSE
BUSY
TNR BUSY
DATA 0
DATA 1
DATA 2
DATA 3
VP DATA 0
VP DATA 1
TNR DATA 0
TNR DATA 1
TNR DATA 2
TNR DATA 3
KS 0
KS 1
KS 2
KS 3
PROG
X1
X2
Vss
RESET
EXP 3
EXP 2
EXP 1
EXP 0
CE
VPS CLK
VPS CTL
TNR STB
MC STB
TNR
AUX
SC
R101 1K
R102 1K
R103 1K
R110 1K
R111 1K
R118 1K
R125 1K
R139 1K
R149 1K
R150 1K
D106
D103
E/EG ONLY
D108
D107
D111
R154 4.7K
R158 33K
TP1
TP2
TP3 GND
R104 4.7K
RA104 220K X 8
RA103 33K X 4
RA105 100K X 6
RA106 220K X 4
RA101 4.7K X 4
R105 1K
R106 10K
R107 10K
R108 10K
R109 1K
R119 4.7K
R120 4.7K
R121 4.7K
R122 4.7K
R131 4.7K
R132 4.7K
R133 4.7K
R134 4.7K
R135 4.7K
R136 4.7K
R137 4.7K
R138 4.7K
R140 4.7K
R141 4.7K
R142 4.7K
R143 4.7K
R145 4.7K
R146 4.7K
R147 4.7K
R148 4.7K
R165 10K
R166 100K
R168 68K
R113 4.7K
R114 4.7K
R115 4.7K
R116 4.7K
R117 4.7K
C105 0.01
C107 0.01
C102 12P
C101 20P
X102
CN3
RESET
CE
S-CLK
S-DATA
BUSY
TIMER 5V
From/To 28 DISPLAY/SWITCH CN1
CN1
KS J
KS 2
NC
KS 1
NC
KS 0
KS G
REMOTE
KS F
CNT PULSE
KS E
STROBE
KS D
DATA 0
KS C
DATA 1
KS B
DATA 2
KS A
DATA 3
KS 3
NC
From/To 05 MOTHER, CN22
CN2
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
UNSW 12V
GND
TNR/AUX
From/To 05 MOTHER, CN23
E/EG ONLY
E MODEL
CN4
DATA 0
DATA 1
CLK
CTL
From/To 06 TERMINAL, CN6
From/To 18 VPS, CN2
EG MODEL
R144 4.7K
B2
R160 4.7K
Q101
Q102
R11 100K
R10 470K
R8 1K
R9 4.7K
R12 680K
Q3
IC2
C9 0.01
C7 10/16
C6 0.01
D8
C4 33/6.3
D7
D3
D2
D6
D1
Q1
C3 33/10
R2 120
R1 2.2K
C2 3.3/50
L1 100
D5 RD9.1ES-T1B2
C1 33/16
D5
R4 10K
R3 6.8K
R5 100K
R6 470
Q2
C5 0.001
R7 150
C8 470/6.3
Q101, Q102
DTC124ES
Q2, Q3
2SC3311A(RS)
IC2
S-8053ALB
D7, D8
RD8.2EB1
D6
DA210S
D1
MTZJ5.1B
Q1
2SC1317R,S
1
2
3
4
5
A
B
C
D
E
F
G
H

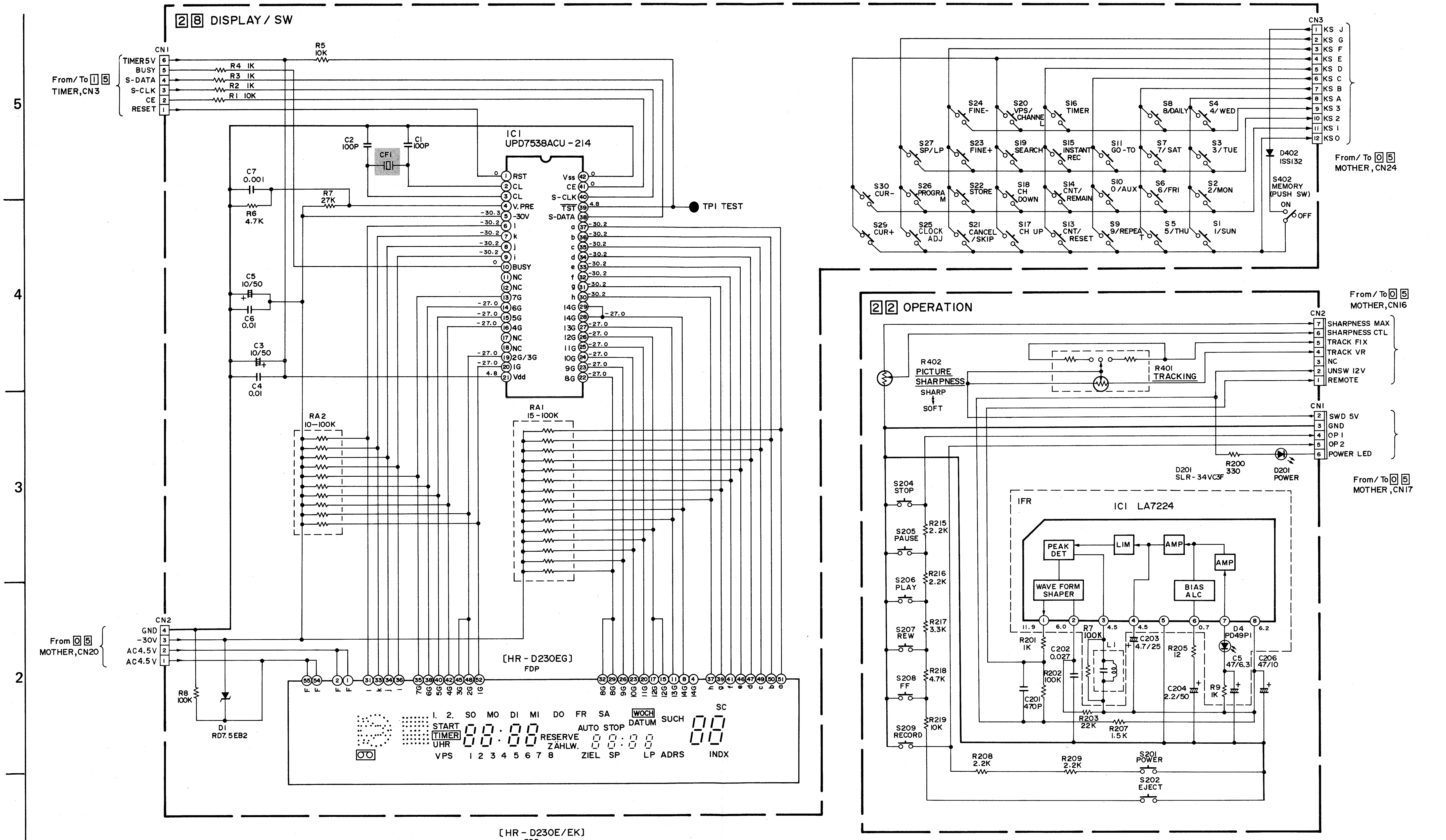
NOTES:

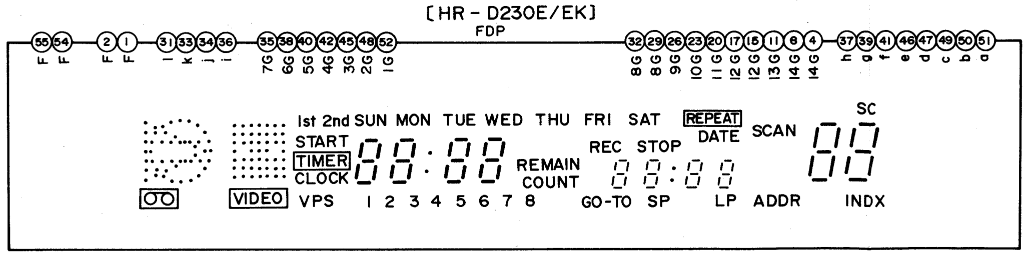
1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

3.28 TIMER CIRCUIT BOARD


C101
TIMER CLOCK
ELNA-437
PB20002 94V-0
TIMER PWB
PB20002 A
TIMER PWB ASS'Y
IC101
IC102
CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
RA101
RA103
RA104
RA105
RA106
X101
X102
TP1
TP2
TP3
GND
J1
L1
Q2
Q3
Q6
Q7
Q9
Q101
Q102
Q103
Q104
A
B
C
D
E
F
G
H
1
2
3
4
5

3.29 DISPLAY/SWITCH, OPERATION AND IFR SCHEMATIC DIAGRAMS


28 DISPLAY / SW
From/To 15 TIMER,CN3
CN1
TIMER5V
BUSY
S-DATA
S-CLK
CE
RESET
R5 10K
R4 1K
R3 1K
R2 1K
R1 10K
IC1 UPD7538ACU-214
C2 100P
C1 100P
CF1
C7 0.001
R6 4.7K
R7 27K
C5 10/50
C6 0.01
C3 10/50
C4 0.01
RST
CL
V.PRE
-30V
BUSY
NC
Vss
CE
S-CLK
TST
S-DATA
Vdd
TP1 TEST
RA2 10-100K
RA1 15-100K
From 05 MOTHER,CN20
CN2
GND
-30V
AC4.5V
AC4.5V
R8 100K
D1 RD7.5EB2
[HR-D230EG]
FDP
1. 2. SO MO DI MI DO FR SA
WOCH
DATUM
SUCH
SC
START
TIMER
UHR
RESERVE
ZÄHLW.
AUTO STOP
VPS
ZIEL SP
LP ADRS
INDX
CN3
KS J
KS G
KS F
KS E
KS D
KS C
KS B
KS A
KS 3
KS 2
KS 1
KS 0
From/To 05 MOTHER,CN24
S24 FINE-
S20 VPS/CHANNEL
S16 TIMER
S8 8/DAILY
S4 4/WED
S27 SP/LP
S23 FINE+
S19 SEARCH
S15 INSTANT REC
S11 GO-TO
S7 7/SAT
S3 3/TUE
S30 CUR-
S26 PROGRAM
S22 STORE
S18 CH DOWN
S14 CNT/REMAIN
S10 0/AUX
S6 6/FRI
S2 2/MON
S29 CUR+
S25 CLOCK ADJ
S21 CANCEL/SKIP
S17 CH UP
S13 CNT/RESET
S9 9/REPEAT
S5 5/THU
S1 1/SUN
D402 1SS132
S402 MEMORY (PUSH SW)
ON
OFF
22 OPERATION
From/To 05 MOTHER,CN16
CN2
SHARPNESS MAX
SHARPNESS CTL
TRACK FIX
TRACK VR
NC
UNSW 12V
REMOTE
R402 PICTURE SHARPNESS
SHARP
SOFT
R401 TRACKING
CN1
SWD 5V
GND
OP 1
OP 2
POWER LED
From/To 05 MOTHER,CN17
D201 SLR-34VC3F
R200 330
D201 POWER
S204 STOP
S205 PAUSE
S206 PLAY
S207 REW
S208 FF
S209 RECORD
R215 2.2K
R216 2.2K
R217 3.3K
R218 4.7K
R219 10K
IFR
IC1 LA7224
PEAK DET
LIM
AMP
AMP
WAVE FORM SHAPER
BIAS ALC
R201 1K
C202 0.027
R7 100K
L1
C203 4.7/25
R205 12
D4 PD49P1
C5 47/6.3
C206 47/10
C201 470P
R202 100K
C204 2.2/50
R9 1K
R203 22K
R207 1.5K
R208 2.2K
R209 2.2K
S201 POWER
S202 EJECT
5
4
3
2


[HR-D230E/EK]
FDP
1st 2nd SUN MON TUE WED THU FRI SAT
REPEAT
DATE
SCAN
SC
START
TIMER
CLOCK
REMAIN COUNT
REC STOP
VIDEO
VPS
GO-TO SP
LP ADDR
INDX
1

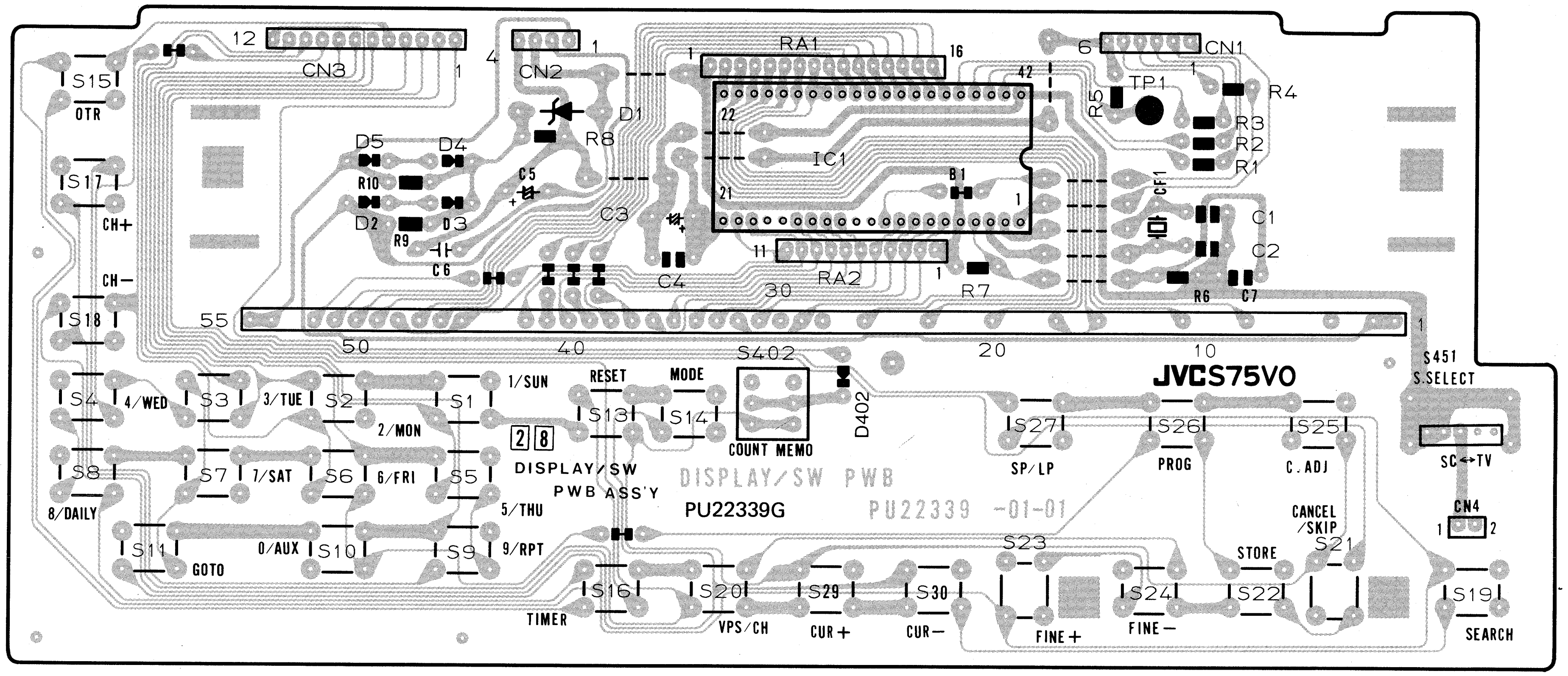
NOTES:

1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

A B C D E F G H

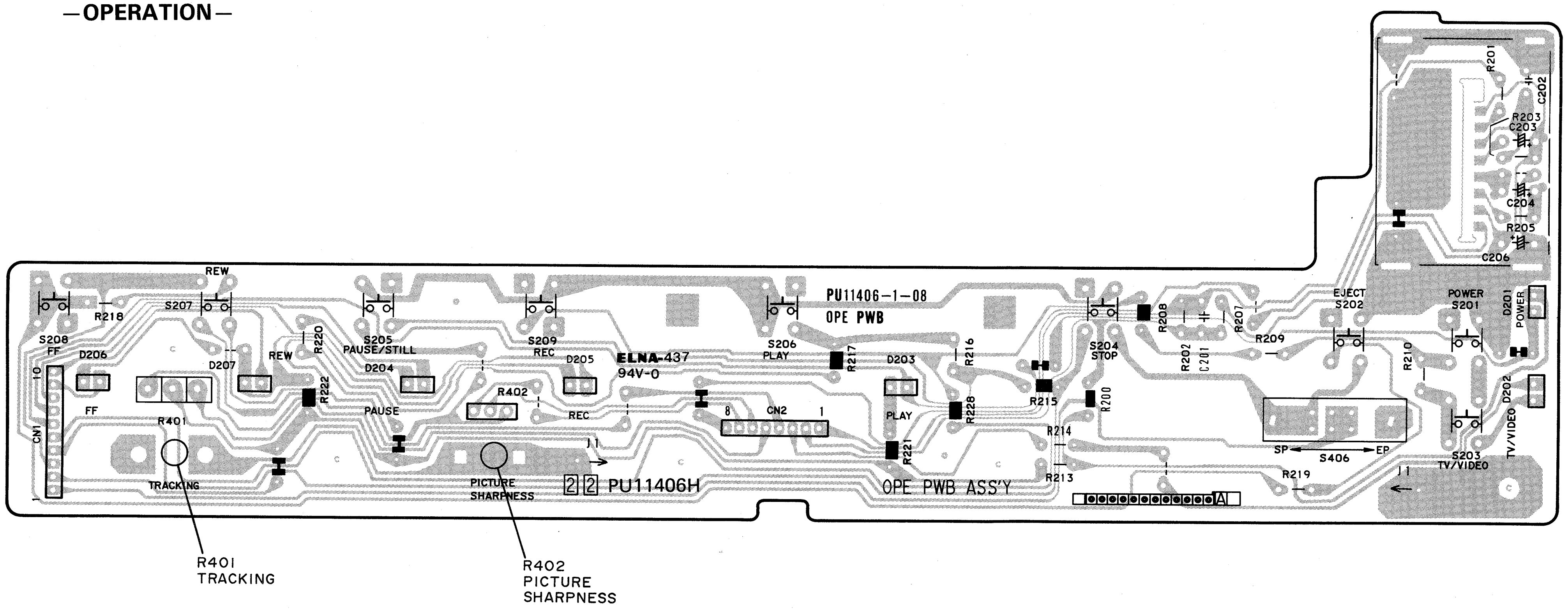
3.30 DISPLAY SWITCH, OPERATION AND IFR CIRCUIT BOARDS

—DISPLAY/SWITCH—



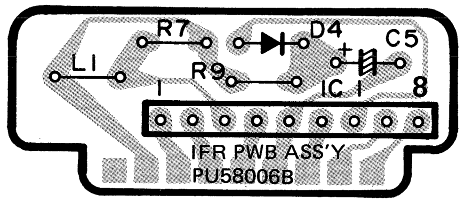
12
CN3
1
4
CN2
1
RA1
16
6
CN1
1
R4
S15
OTR
D1
R8
42
22
IC1
21
B1
R5
TP1
R3
R2
R1
D5
D4
R10
C5
D2
D3
R9
C6
C3
C4
CF1
C1
C2
S17
CH+
CH−
11
RA2
1
30
R7
R6
C7
S18
55
50
40
20
10
1
S402
S451
S.SELECT
S4
4/WED
S3
3/TUE
S2
2/MON
S1
1/SUN
RESET
MODE
S13
S14
COUNT MEMO
D402
JVCS75VO
S27
SP/LP
S26
PROG
S25
C.ADJ
SC↔TV
CN4
1
2
2 8
DISPLAY/SW
PWB ASS'Y
DISPLAY/SW PWB
PU22339G
PU22339 -01-01
S8
8/DAILY
S7
7/SAT
S6
6/FRI
S5
5/THU
CANCEL
/SKIP
S11
GOTO
0/AUX
S10
S9
9/RPT
S23
STORE
S21
S16
TIMER
S20
VPS/CH
S29
CUR+
S30
CUR−
FINE+
S24
FINE−
S22
S19
SEARCH

—OPERATION—



R201
C202
R203
C203
C204
R205
C206
REW
S207
R218
S208
FF
D206
10
CN1
1
D207
REW
R220
S205
PAUSE/STILL
D204
R222
PAUSE
S209
REC
D205
R402
REC
ELNA-437
94V-0
PU11406-1-08
OPE PWB
S206
PLAY
R217
D203
PLAY
8
CN2
1
R221
R216
R228
S204
STOP
R215
R200
R214
R213
R208
R202
C201
R207
R209
EJECT
S202
POWER
S201
D201
POWER
R210
D202
S406
SP
EP
S203
TV/VIDEO
TV/VIDEO
R219
J1
FF
R401
TRACKING
PICTURE
SHARPNESS
J1
2 2
PU11406H
OPE PWB ASS'Y
A
R401
TRACKING
R402
PICTURE
SHARPNESS

—IFR—

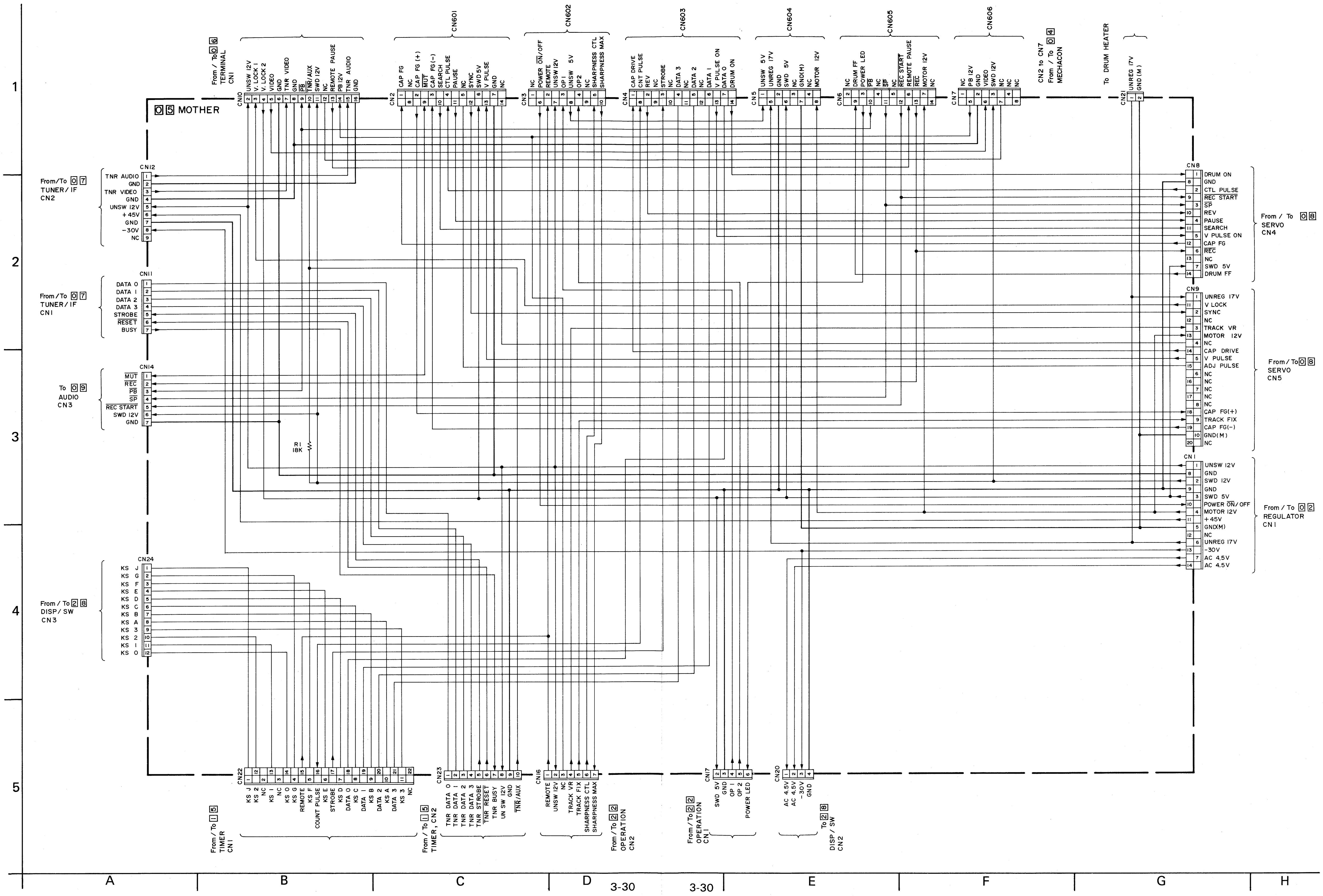


R7
D4
C5
L1
R9
IC1
1
8
IFR PWB ASS'Y
PU58006B

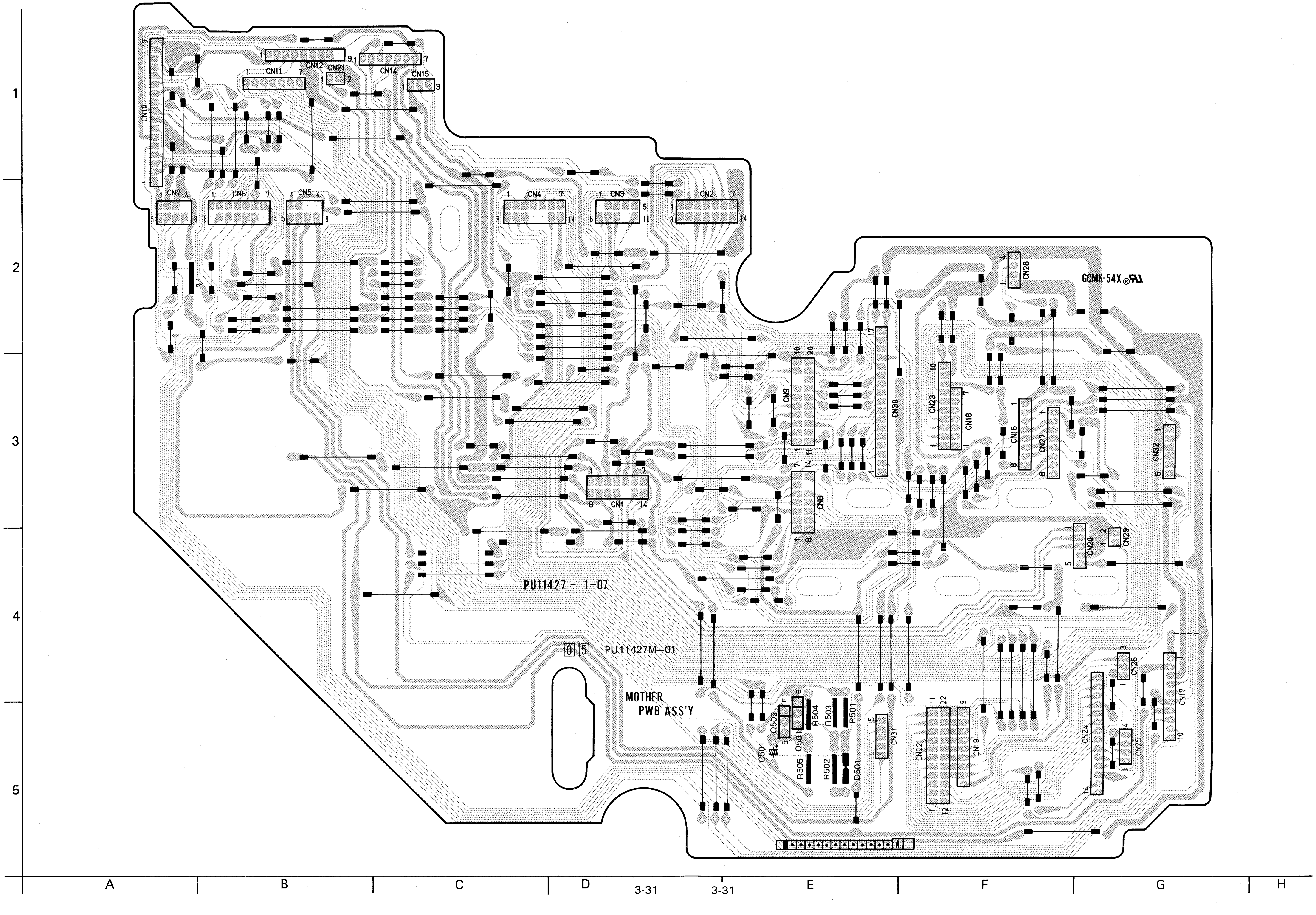
1 2 3 4 5

A B C D E F G H

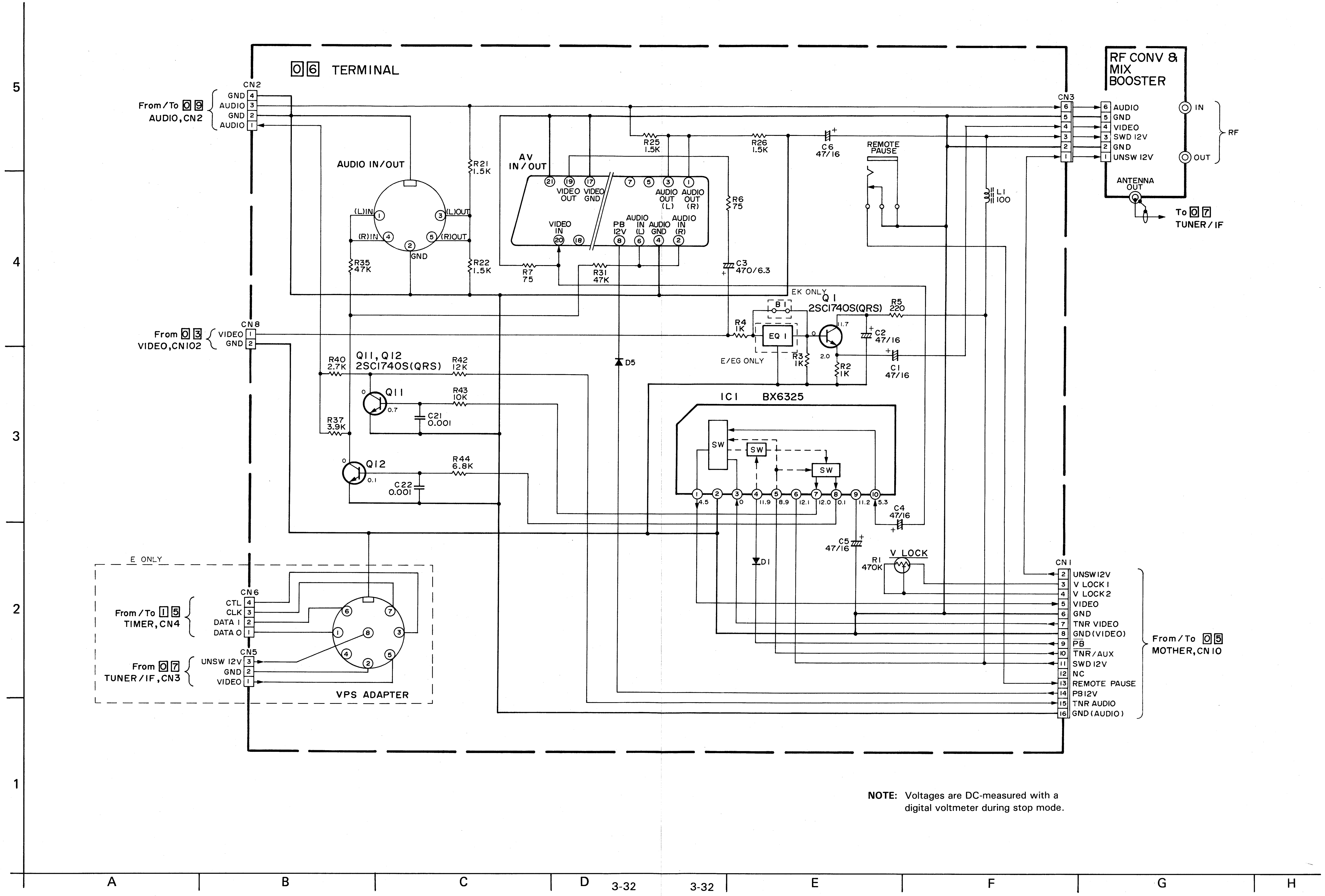
3.31 MOTHER SCHEMATIC DIAGRAM


05 MOTHER
From / To 06 TERMINAL CN1
CN10
UNSW 12V
V. LOCK 1
V. LOCK 2
VIDEO
GND
TNR VIDEO
GND
PB
TNR/AUX
SWD 12V
NC
REMOTE PAUSE
PB 12V
TNR AUDIO
GND
CN601
CN2
CAP FG
NC
CAP FG (+)
MUT
CAP FG(−)
SEARCH
CTL PULSE
PAUSE
NC
SYNC
SWD 5V
V PULSE
GND
NC
CN602
CN3
NC
POWER ON/OFF
REMOTE
UNSW 12V
OP 1
UNSW 5V
OP 2
NC
SHARPNESS CTL
SHARPNESS MAX
CN603
CN4
CAP DRIVE
CNT PULSE
REV
NC
STROBE
NC
DATA 3
NC
DATA 2
NC
DATA 1
V PULSE ON
DATA 0
DRUM ON
CN604
CN5
UNSW 5V
UNREG 17V
GND
SWD 5V
NC
GND(M)
NC
MOTOR 12V
CN605
CN6
NC
DRUM FF
POWER LED
PB
NC
SP
NC
REC START
REMOTE PAUSE
REC
MOTOR 12V
NC
CN606
CN7
NC
PB 12V
GND
VIDEO
SWD 12V
NC
NC
NC
CN2 to CN7 From / To 04 MECHACON
To DRUM HEATER
CN21
UNREG 17V
GND(M)
From/To 07 TUNER/IF CN2
CN12
TNR AUDIO
GND
TNR VIDEO
GND
UNSW 12V
+45V
GND
−30V
NC
From/To 07 TUNER/IF CN1
CN11
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
To 09 AUDIO CN3
CN14
MUT
REC
PB
SP
REC START
SWD 12V
GND
R1 18K
From / To 28 DISP/SW CN3
CN24
KS J
KS G
KS F
KS E
KS D
KS C
KS B
KS A
KS 3
KS 2
KS 1
KS 0
CN8
DRUM ON
GND
CTL PULSE
REC START
SP
REV
PAUSE
SEARCH
V PULSE ON
CAP FG
REC
NC
SWD 5V
DRUM FF
From / To 08 SERVO CN4
CN9
UNREG 17V
V LOCK
SYNC
NC
TRACK VR
MOTOR 12V
NC
CAP DRIVE
V PULSE
ADJ PULSE
NC
NC
NC
NC
NC
CAP FG(+)
TRACK FIX
CAP FG(−)
GND(M)
NC
From/To 08 SERVO CN5
CN1
UNSW 12V
GND
SWD 12V
GND
SWD 5V
POWER ON/OFF
MOTOR 12V
+45V
GND(M)
NC
UNREG 17V
−30V
AC 4.5V
AC 4.5V
From / To 02 REGULATOR CN1
CN22
KS J
KS 2
NC
KS 1
NC
KS 0
KS G
REMOTE
KS F
COUNT PULSE
KS E
STROBE
KS D
DATA 0
KS C
DATA 1
KS B
DATA 2
KS A
DATA 3
KS 3
NC
From / To 15 TIMER CN1
CN23
TNR DATA 0
TNR DATA 1
TNR DATA 2
TNR DATA 3
TNR STROBE
TNR RESET
TNR BUSY
UN SW 12V
GND
TNR/AUX
From / To 15 TIMER, CN2
CN16
REMOTE
UNSW 12V
NC
TRACK VR
TRACK FIX
SHARPNESS CTL
SHARPNESS MAX
From / To 22 OPERATION CN2
CN17
SWD 5V
GND
OP 1
OP 2
POWER LED
From / To 22 OPERATION CN1
CN20
AC 4.5V
AC 4.5V
−30V
GND
To 28 DISP / SW CN2
1
2
3
4
5
A
B
C
D
E
F
G
H

3.32 MOTHER CIRCUIT BOARD

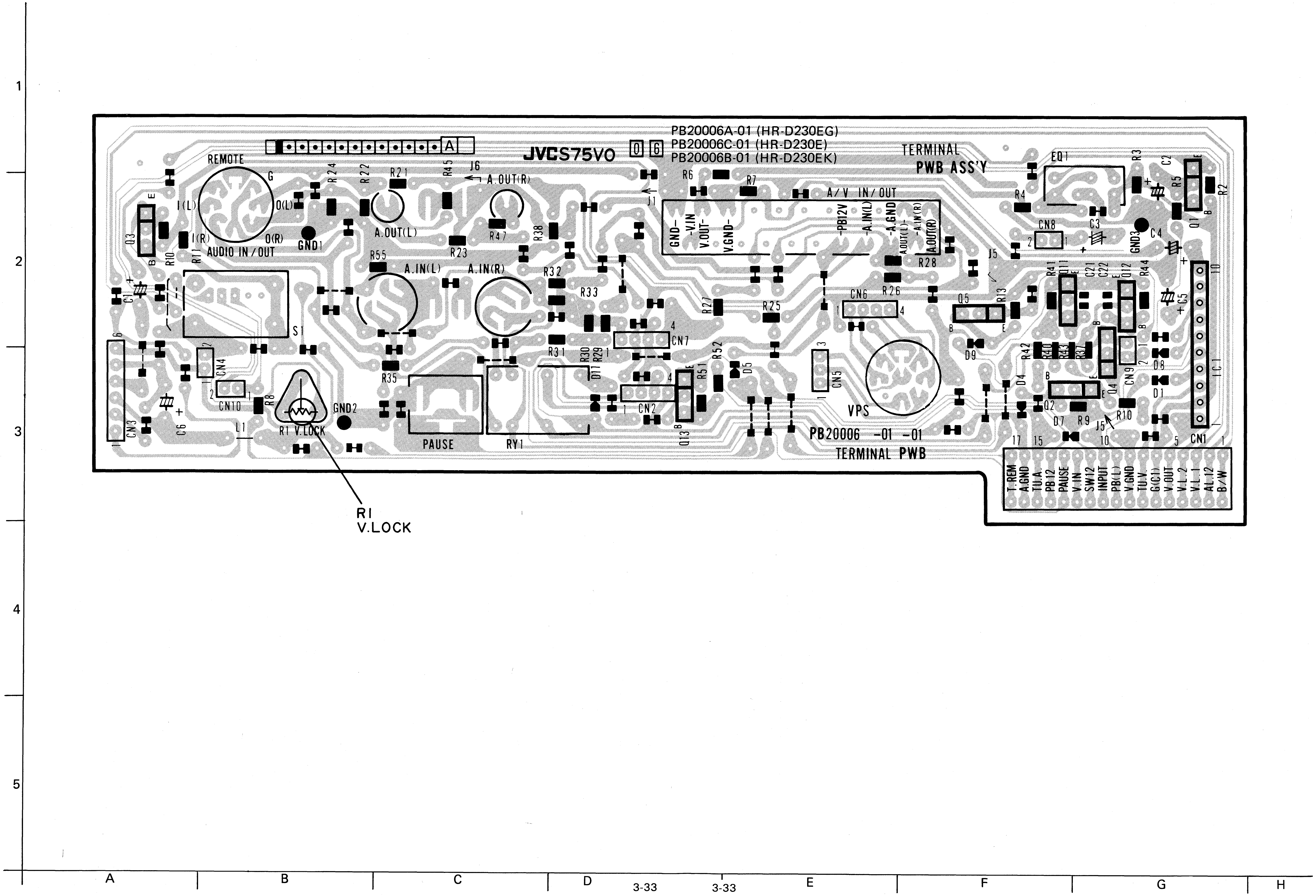

CN10
CN12
CN11
CN21
CN14
CN15
CN7
CN6
CN5
CN4
CN3
CN2
CN28
GCMK-54X
CN9
CN30
CN23
CN18
CN16
CN27
CN32
CN8
CN1
CN20
CN29
PU11427 - 1-07
0 5
PU11427M-01
MOTHER
PWB ASS'Y
Q502
Q501
C501
R504
R503
R501
R505
R502
D501
CN31
CN22
CN19
CN26
CN24
CN25
CN17
1
2
3
4
5
A
B
C
D
E
F
G
H

3.33 TERMINAL SCHEMATIC DIAGRAM

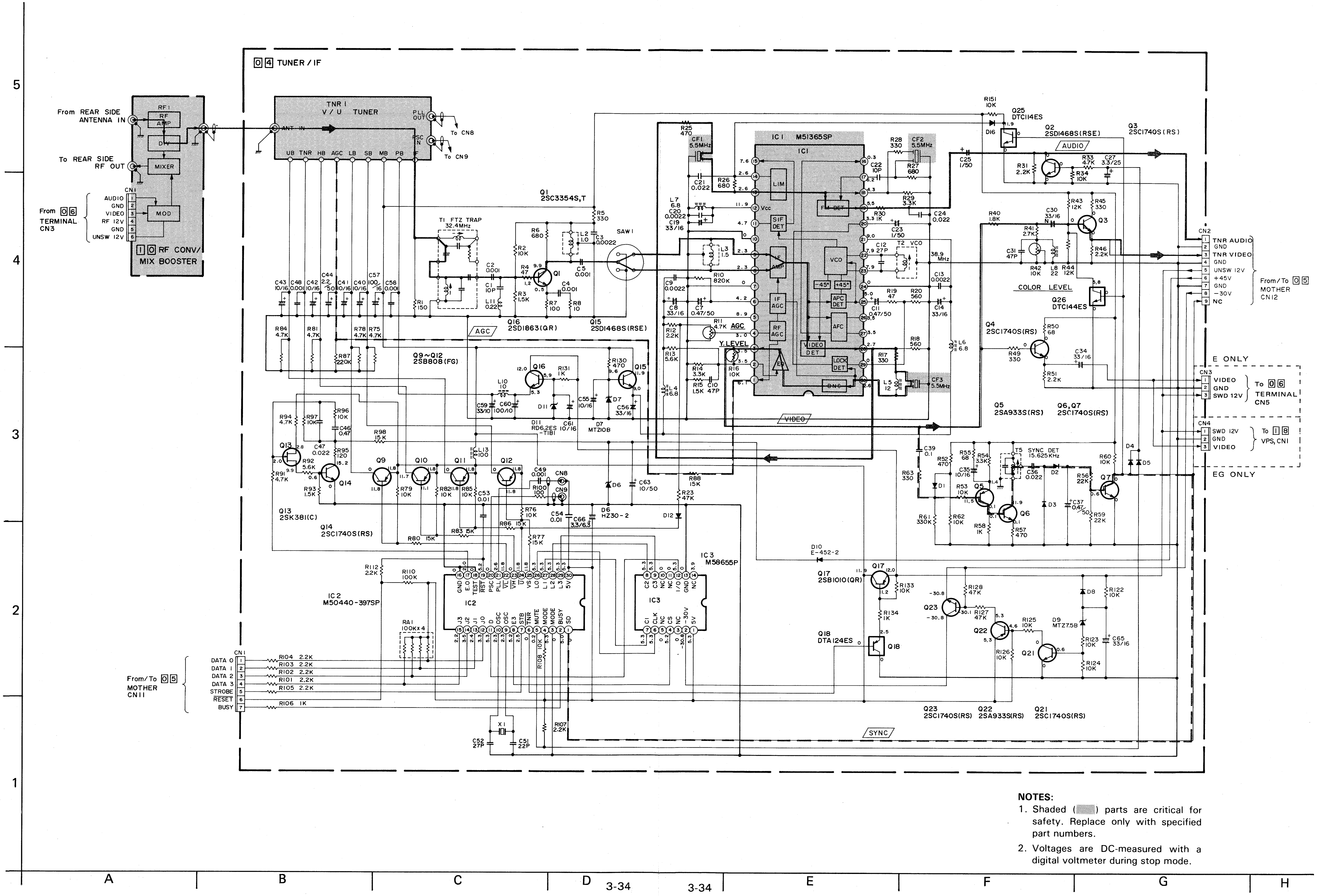

06 TERMINAL
From/To 09 AUDIO,CN2
CN2
GND 4
AUDIO 3
GND 2
AUDIO 1
AUDIO IN/OUT
(L)IN 1
(R)IN 4
2 GND
3 (L)OUT
5 (R)OUT
R21 1.5K
R22 1.5K
R35 47K
AV IN/OUT
21
19 VIDEO OUT
17 VIDEO GND
7
5
3 AUDIO OUT (L)
1 AUDIO OUT (R)
20 VIDEO IN
18
8 PB 12V
6 AUDIO IN (L)
4 AUDIO GND
2 AUDIO IN (R)
R7 75
R31 47K
R25 1.5K
R26 1.5K
C6 47/16
R6 75
C3 470/6.3
REMOTE PAUSE
L1 100
RF CONV & MIX BOOSTER
CN3
6 AUDIO
5 GND
4 VIDEO
3 SWD 12V
2 GND
1 UNSW 12V
IN
OUT
RF
ANTENNA OUT
To 07 TUNER/IF
From 03 VIDEO,CN102
CN8
VIDEO 1
GND 2
EK ONLY
B1
Q1 2SC1740S(QRS)
R5 220
R4 1K
EQ 1
E/EG ONLY
R3 1K
R2 1K
C2 47/16
C1 47/16
11.7
0
2.0
R40 2.7K
Q11, Q12 2SC1740S(QRS)
R42 12K
Q11
R43 10K
C21 0.001
R37 3.9K
Q12
R44 6.8K
C22 0.001
0
0.7
0.1
D5
IC1 BX6325
SW
SW
SW
1 4.5
2
3 0
4 11.9
5 8.9
6 12.1
7 12.0
8 0.1
9 11.2
10 5.3
C4 47/16
C5 47/16
D1
R1 470K
V LOCK
E ONLY
From/To 15 TIMER,CN4
CN6
CTL 4
CLK 3
DATA I 2
DATA O 1
From 07 TUNER/IF,CN3
CN5
UNSW 12V 3
GND 2
VIDEO 1
VPS ADAPTER
CN1
2 UNSW12V
3 V LOCK1
4 V LOCK2
5 VIDEO
6 GND
7 TNR VIDEO
8 GND(VIDEO)
9 PB
10 TNR/AUX
11 SWD 12V
12 NC
13 REMOTE PAUSE
14 PB12V
15 TNR AUDIO
16 GND(AUDIO)
From/To 05 MOTHER,CN10
5
4
3
2
1
A
B
C
D
E
F
G
H

NOTE: Voltages are DC-measured with a digital voltmeter during stop mode.

3.34 TERMINAL CIRCUIT BOARD


PB20006A-01 (HR-D230EG)
PB20006C-01 (HR-D230E)
PB20006B-01 (HR-D230EK)
JVCS75VO
TERMINAL
PWB ASS'Y
REMOTE
AUDIO IN / OUT
A.OUT(L)
A.OUT(R)
A.IN(L)
A.IN(R)
A / V IN / OUT
GND–
-V.IN
V.OUT–
V.GND–
-PB12V
-A.IN(L)
-A.GND
A.OUT(L)
A.IN(R)
A.OUT(R)
GND1
GND2
GND3
R1 V.LOCK
PAUSE
RY1
S1
VPS
PB20006 -01 -01
TERMINAL PWB
T.REM
A.GND
TU.A.
PB.12
PAUSE
V.IN
SW12
INPUT
PB(L)
V.GND
TU.V.
G(C1)
V.OUT
V.L.2
V.L.1
AL.12
B/W
CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
CN9
CN10
IC1
EQ1
Q1
Q2
Q3
Q4
Q5
Q11
Q12
Q13
J1
J5
J6
L1
R1
V.LOCK
1
2
3
4
5
A
B
C
D
E
F
G
H

3.35 TUNER/IF SCHEMATIC DIAGRAM (E/EG MODELS)

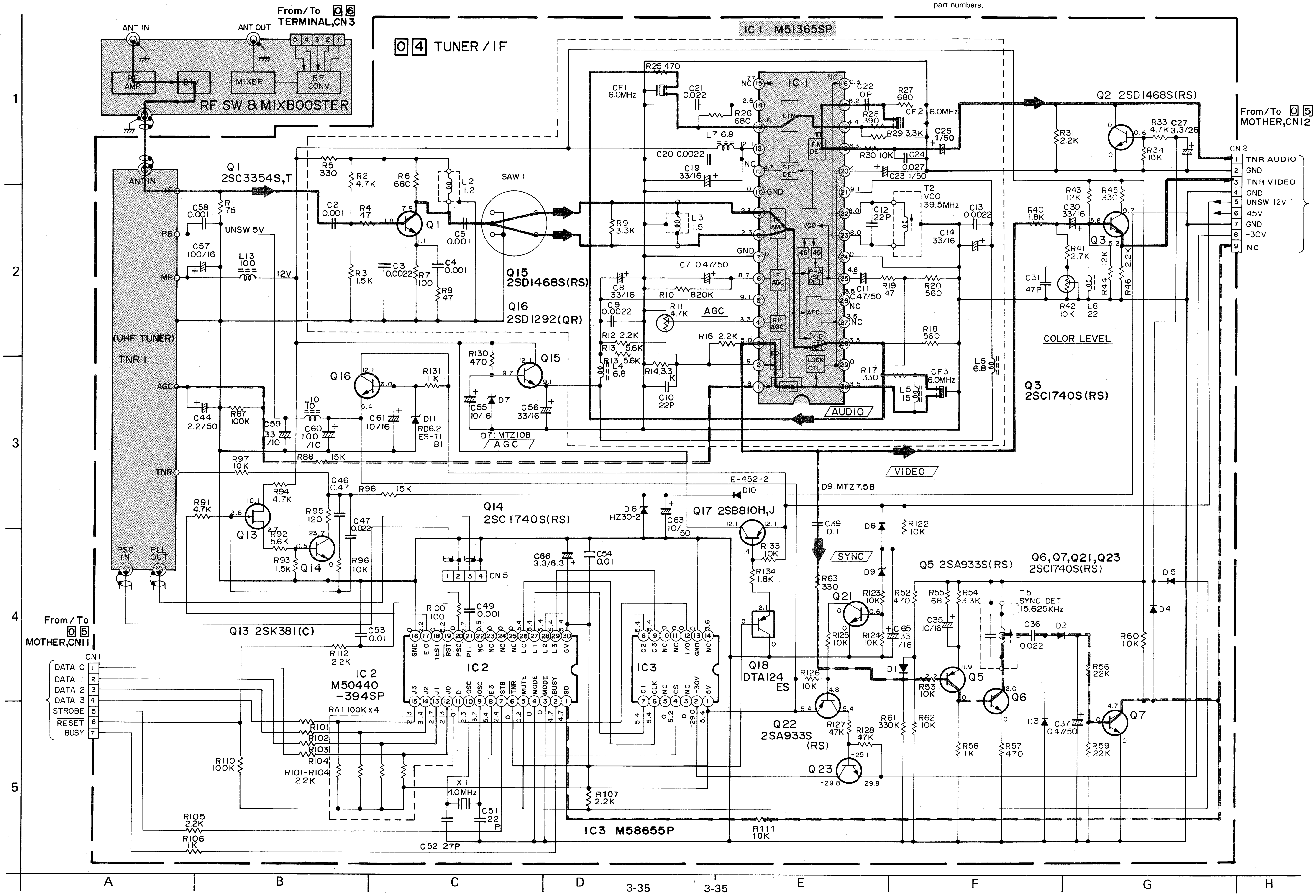

0 4 TUNER / IF
From REAR SIDE ANTENNA IN
To REAR SIDE RF OUT
RF1 RF AMP
DIV
MIXER
MOD
From 0 6 TERMINAL CN3
AUDIO
GND
VIDEO
RF 12V
GND
UNSW 12V
1 0 RF CONV/ MIX BOOSTER
TNR1 V/U TUNER
ANT IN
PLL OUT
PSC IN
To CN8
To CN9
UB TNR HB AGC LB SB MB PB IF
Q1 2SC3354S,T
T1 FTZ TRAP 32.4MHz
SAW1
IC1 M51365SP
LIM
SIF DET
IF AMP
IF AGC
RF AGC
FM DET
VCO
-45°
+45°
APC DET
AFC
VIDEO DET
LOCK DET
DNC
CF1 5.5MHz
CF2 5.5MHz
CF3 5.5MHz
T2 VCO
38.9 MHz
AGC
Y.LEVEL
VIDEO
AUDIO
COLOR LEVEL
Q2 2SD1468S(RSE)
Q3 2SC1740S(RS)
Q25 DTC114ES
Q26 DTC144ES
Q4 2SC1740S(RS)
Q5 2SA933S(RS)
Q6,Q7 2SC1740S(RS)
T5 SYNC DET 15.625KHz
Q15 2SD1468S(RSE)
Q16 2SD1863(QR)
Q9~Q12 2SB808(FG)
Q13 2SK381(C)
Q14 2SC1740S(RS)
D11 RD6.2ES -TIB1
D7 MTZ10B
D6 HZ30-2
D10 E-452-2
D9 MTZ7.5B
IC2 M50440-397SP
IC3 M58655P
Q17 2SB1010(QR)
Q18 DTA124ES
Q23 2SC1740S(RS)
Q22 2SA933S(RS)
Q21 2SC1740S(RS)
RA1 100K×4
X1
SYNC
CN1
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
From/To 0 5 MOTHER CN11
CN2
TNR AUDIO
GND
TNR VIDEO
GND
UNSW 12V
+45V
GND
-30V
NC
From/To 0 5 MOTHER CN12
E ONLY
CN3
VIDEO
GND
SWD 12V
To 0 6 TERMINAL CN5
CN4
SWD 12V
GND
VIDEO
To 1 8 VPS,CN1
EG ONLY
A
B
C
D
E
F
G
H
1
2
3
4
5

NOTES:

1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

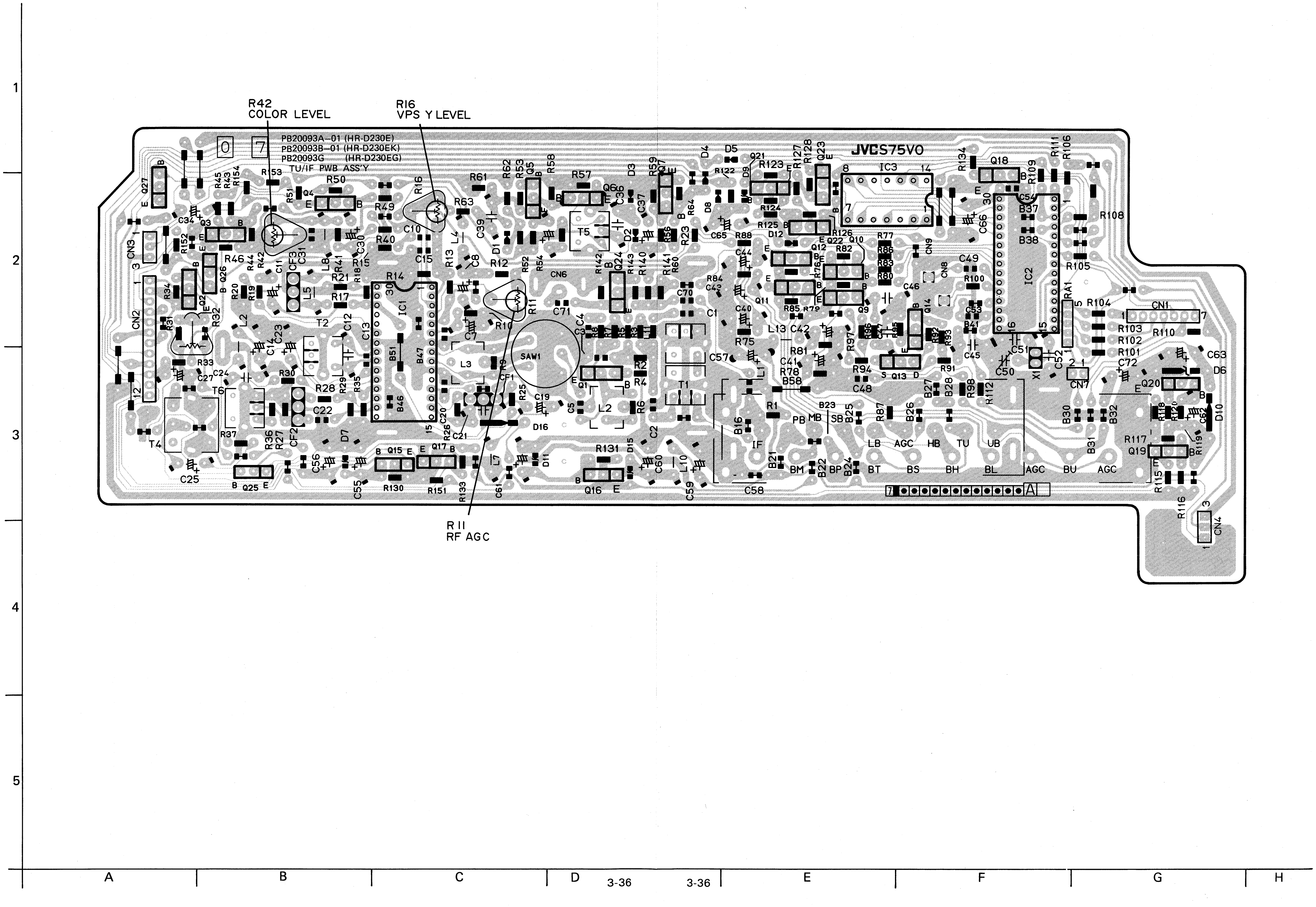
3.36 TUNER/IF SCHEMATIC DIAGRAM (EK MODEL)

NOTES:
1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.



From/To 06 TERMINAL,CN3
ANT IN
ANT OUT
RF AMP
DIV
MIXER
RF CONV.
RF SW & MIXBOOSTER
04 TUNER/IF
IC1 M51365SP
From/To 05 MOTHER,CN12
CN2
1 TNR AUDIO
2 GND
3 TNR VIDEO
4 GND
5 UNSW 12V
6 45V
7 GND
8 -30V
9 NC
Q1 2SC3354S,T
Q2 2SD1468S(RS)
Q3 2SC1740S(RS)
Q15 2SD1468S(RS)
Q16 2SD1292(QR)
Q14 2SC1740S(RS)
Q17 2SB810H,J
Q13 2SK381(C)
Q5 2SA933S(RS)
Q6,Q7,Q21,Q23 2SC1740S(RS)
Q18 DTA124 ES
Q22 2SA933S (RS)
SAW 1
CF1 6.0MHz
CF2 6.0MHz
CF3 6.0MHz
T2 VCO 39.5MHz
T5 SYNC DET 15.625KHz
X1 4.0MHz
(UHF TUNER) TNR1
ANT IN
IF
PB
MB
AGC
TNR
PSC IN
PLL OUT
UNSW 5V
12V
AGC
D7: MTZ10B
D9: MTZ7.5B
D6 HZ30-2
D11 RD6.2 ES-T1 B1
E-452-2
AUDIO
VIDEO
SYNC
COLOR LEVEL
IC2 M50440 -394SP
IC3 M58655P
CN5
From/To 05 MOTHER,CN11
CN1
DATA 0
DATA 1
DATA 2
DATA 3
STROBE
RESET
BUSY
RA1 100K x 4
R101-R104 2.2K
A B C D E F G H
1 2 3 4 5

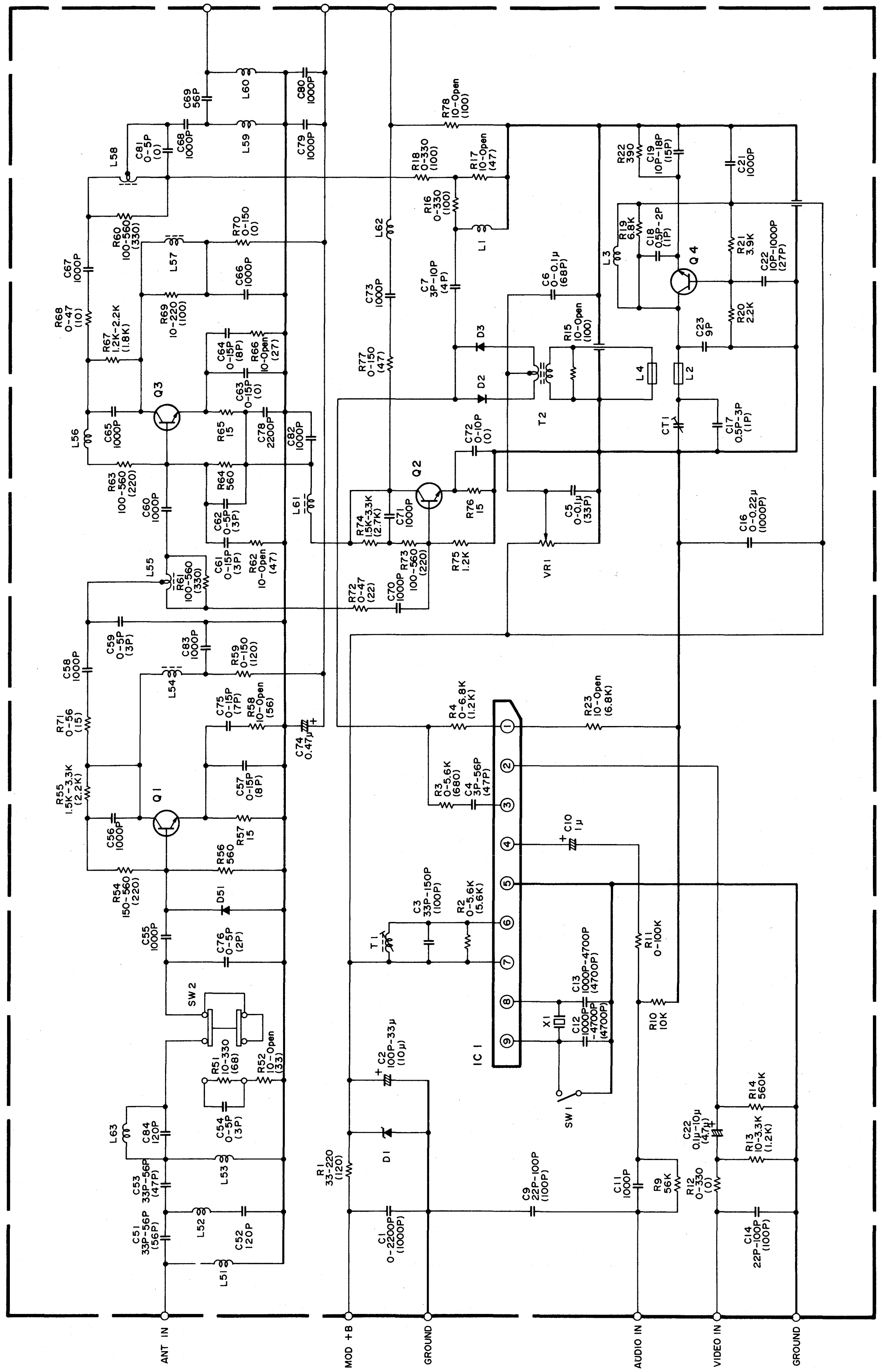
3.37 TUNER/IF CIRCUIT BOARD


R42
COLOR LEVEL
R16
VPS Y LEVEL
R11
RF AGC
PB20093A-01 (HR-D230E)
PB20093B-01 (HR-D230EK)
PB20093G (HR-D230EG)
TU/IF PWB ASS'Y
JVC S75V0
IC1
IC2
IC3
SAW1
CN1
CN2
CN3
CN4
CN6
CN7
IF
PB
MB
SB
LB
AGC
HB
TU
UB
BM
BP
BT
BS
BH
BL
BU
1
2
3
4
5
A
B
C
D
E
F
G
H

3.38 RF CONVERTER AND MIX BOOSTER SCHEMATIC DIAGRAM

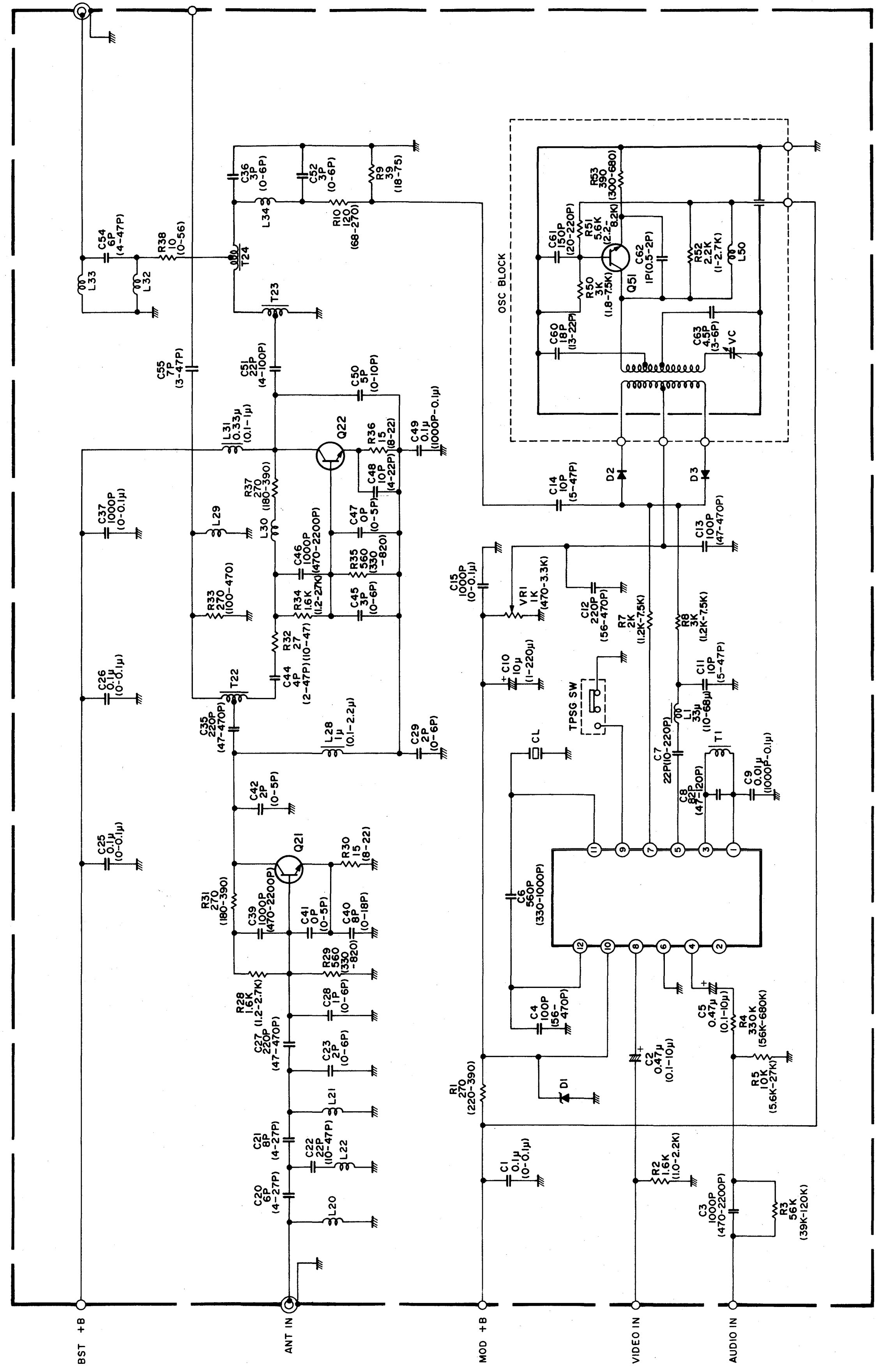
—HR-D230E/EG MODELS—

Note:
1. All parts slown in this schematic are critical for safety.
2. This schematic is only for reference.
   Avoid replacing individual parts.
   Replace the entire unit only.


TV OUT
BST +B
VTR OUT
ANT IN
MOD +B
GROUND
AUDIO IN
VIDEO IN
GROUND
IC 1
Q 1
Q 2
Q 3
Q 4
SW 1
SW 2
X1
VR1
T1
T2
CT1
D1
D2
D3
D51

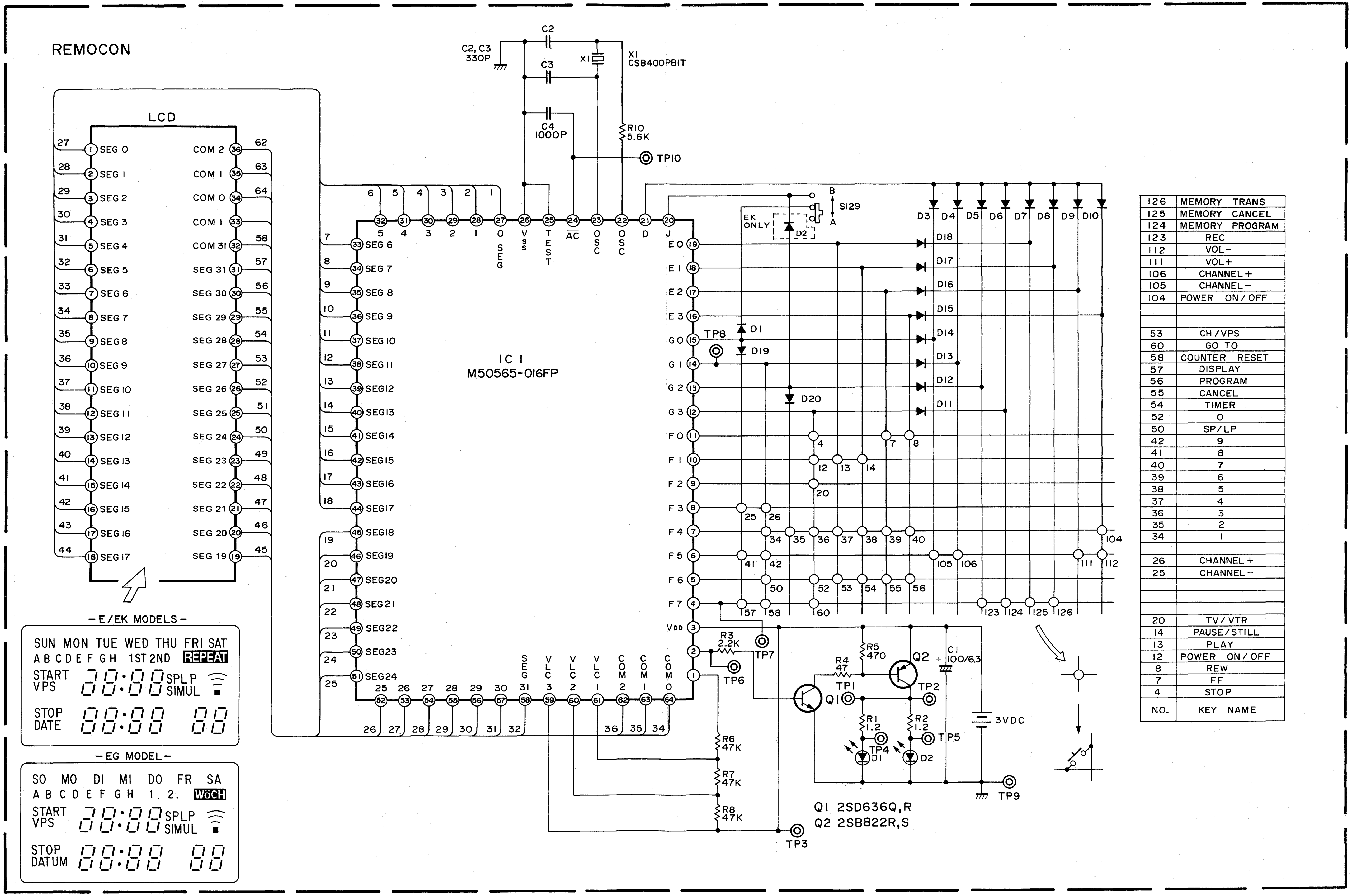
—HR-D230EK MODEL—

Note:
1. All parts slown in this schematic are critical for safety.
2. This schematic is only for reference.
   Avoid replacing individual parts.
   Replace the entire unit only.


ANT OUT
VTR TU
BST +B
ANT IN
MOD +B
VIDEO IN
AUDIO IN
OSC BLOCK
TPSG SW
Q21
Q22
Q51
VR1
T1
D1
D2
D3

5
4
3
2
1

3.39 REMOTE CONTROL SCHEMATIC DIAGRAM



REMOCON
LCD
IC I
M50565-016FP
C2, C3
330P
C2
C3
C4
1000P
X1
CSB400PBIT
R10
5.6K
TP10
S129
EK ONLY
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
TP8
R3
2.2K
TP7
TP6
R4
47
R5
470
C1
100/6.3
Q1
Q2
TP1
TP2
R1
1.2
R2
1.2
TP4
TP5
3VDC
TP9
R6
47K
R7
47K
R8
47K
TP3
Q1 2SD636Q,R
Q2 2SB822R,S
- E/EK MODELS -
SUN MON TUE WED THU FRI SAT
A B C D E F G H 1ST 2ND REPEAT
START VPS
SPLP
SIMUL
STOP DATE
- EG MODEL -
SO MO DI MI DO FR SA
A B C D E F G H 1. 2. WöCH
START VPS
SPLP
SIMUL
STOP DATUM

NO.	KEY NAME
126	MEMORY TRANS
125	MEMORY CANCEL
124	MEMORY PROGRAM
123	REC
112	VOL-
111	VOL+
106	CHANNEL +
105	CHANNEL -
104	POWER ON / OFF
53	CH / VPS
60	GO TO
58	COUNTER RESET
57	DISPLAY
56	PROGRAM
55	CANCEL
54	TIMER
52	0
50	SP/LP
42	9
41	8
40	7
39	6
38	5
37	4
36	3
35	2
34	1
26	CHANNEL +
25	CHANNEL -
20	TV / VTR
14	PAUSE / STILL
13	PLAY
12	POWER ON / OFF
8	REW
7	FF
4	STOP

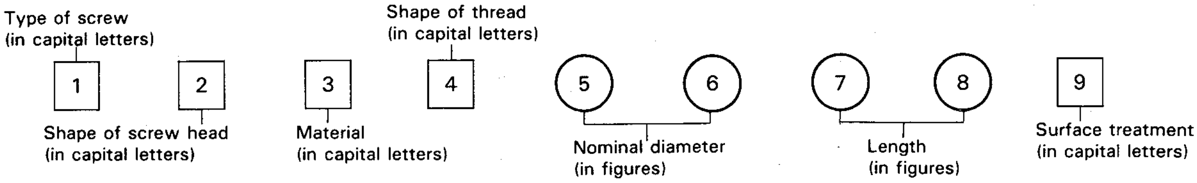
NOTE: This schematic parts are critical for safety.
Replace only with specified part numbers.

SECTION 4
EXPLODED VIEWS AND PARTS LIST

4.1 STANDARD PART NUMBER CODING

4.1.1 Screw coding

Standard screw part numbers are as follows.


Type of screw (in capital letters)
1
2
Shape of screw head (in capital letters)
3
Material (in capital letters)
Shape of thread (in capital letters)
4
5
6
Nominal diameter (in figures)
7
8
Length (in figures)
9
Surface treatment (in capital letters)

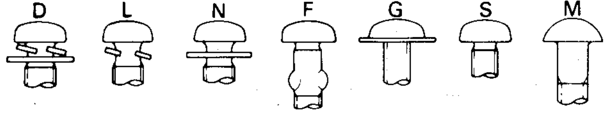
Type of screw (first digit)

S	Normal screws
D	Assembled machine screws (with plain and spring washers)
L	〃 (with spring washer)
N	〃 (with plain washer)
F	Feather screws
G	Washer head tapping screws
M	Wood screws

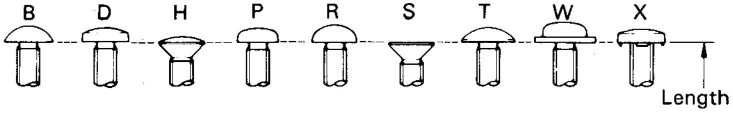
Shape of screw head (second digit)

B	Brazier head
D	Binding head
H	Oval countersunk head
P	Pan head
R	Round head
S	Flat head
T	Truss head
W	Washer head (machine screws)
X	Toothed head

—Type of screw (first digit)—



—Shape of screw head (second digit)—


B
D
H
P
R
S
T
W
X
Length

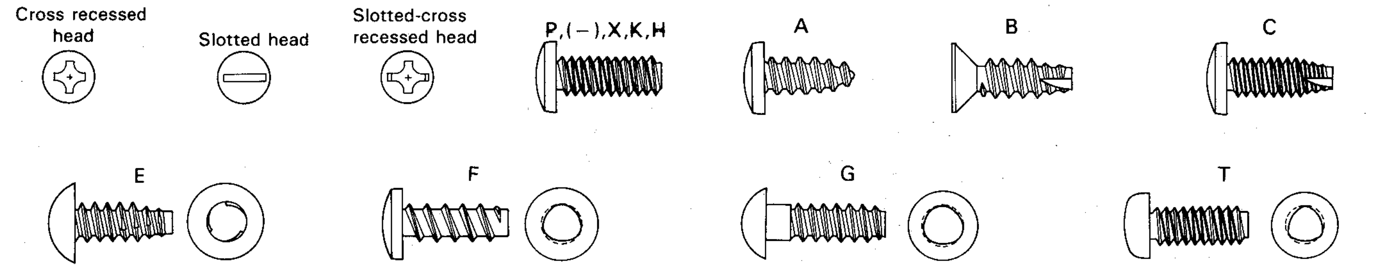
Material (third digit)

S	Steel
E	Stainless steel
C	Cast iron
U	Copper
B	Brass
P	Phosphor bronze
N	Nickel silver
Y	Cast brass
A	Aluminum
Z	Zinc alloy
K	Polycarbonate

Shape of thread (fourth digit)

P	Cross recessed head screws	
(−)	Slotted head machine screws	
X	Slotted-cross recessed head machine screws	
K	Cross recessed head machine screws for precision equipment	(type 1)
H	〃	(type 3)
A	Cross recessed head tapping screws	(type 1)
B	〃	(type 2)
C	〃	(type 3)
E	Cross recessed head special tapping screws	(brand : evertight)
F	〃	(brand : P-tight)
T	〃	(brand : taptight)
G	〃	

—Shape of thread (fourth digit)—


Cross recessed head
Slotted head
Slotted-cross recessed head
P,(−),X,K,H
A
B
C
E
F
G
T

Nominal diameter (fifth and sixth digits)

The fifth and sixth digits indicate a nominal diameter or dimension. If the dimension exceeds 10 mm, three digits are used. The number indicates a nominal diameter or dimension, given in millimeters, multiplied by ten.

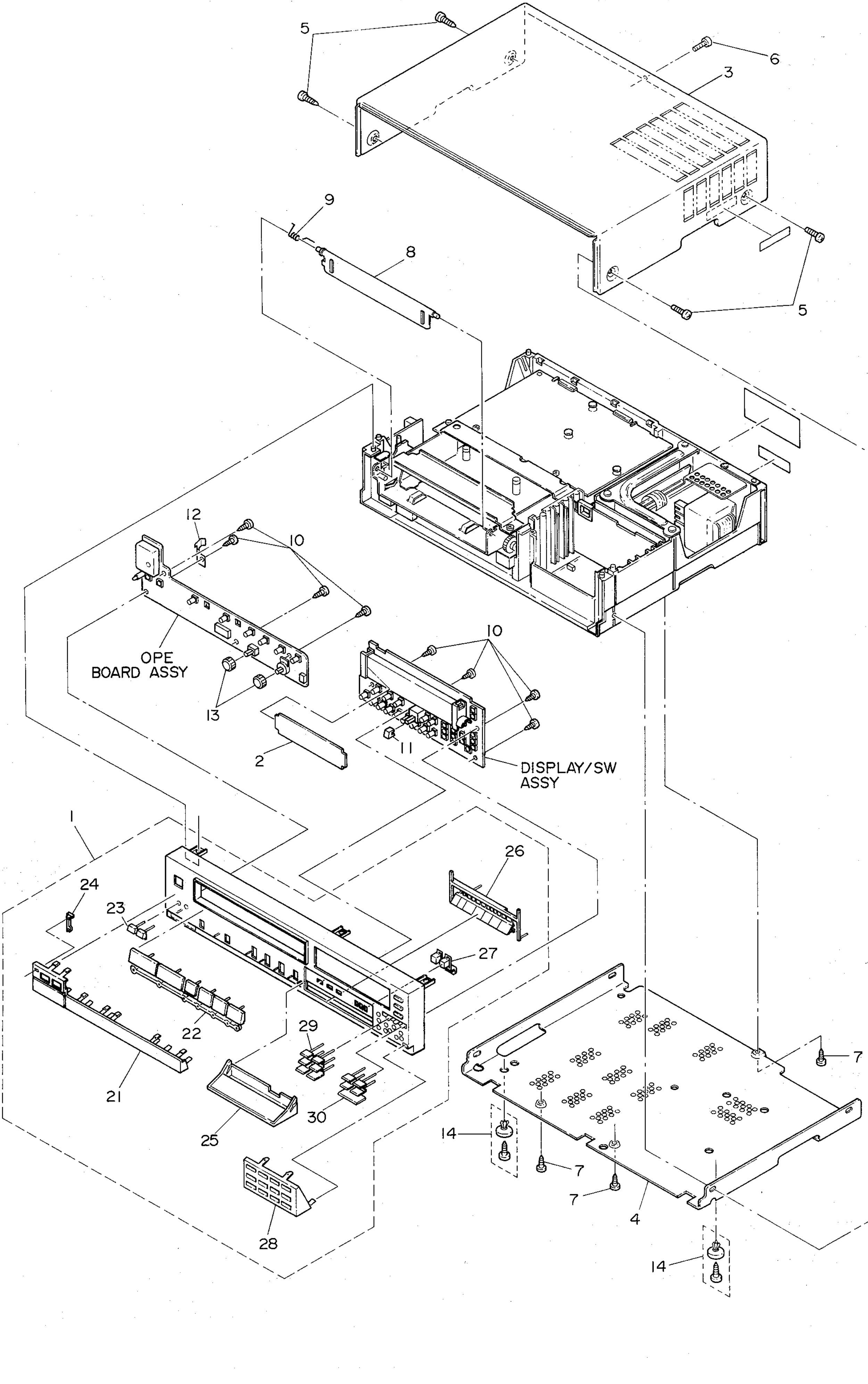
Length (seventh and eighth digits)

The seventh and eighth digits indicate length in millimeters. The preceding figure is zero when the dimension is smaller than 10 mm. For machine screws used in precision equipment whose length is given in units of 0.1 mm, the number indicates ten times the size of their length.

Surface treatment (ninth digit)

Z	Dichromate treatment after galvanizing (MFZn II-C)
N	Nickel plating (MFNiII, MFNiI)
R	Chromium plating (MBCrII, MBCrI)
G	Silver plating (SP4)
B	Black coating after plating
F	Blackening of iron (FB)
M	Blackening after galvanizing
K	Pickling of brass (PF2)
P	Phosphate treatment
W	Uni-chrome plating
L	Coated with transparent paint
A	Colored red after galvanizing (MFZnII-C)
C	Colored blue after galvanizing (MFZzII-C)
T	Colored green after galvanizing (MFZnII-C)
V	Colored purple after galvanizing (MFZnII-C)

4.2 CABINET ASSEMBLY <M2>


5
6
3
9
8
5
12
10
OPE
BOARD ASSY
13
10
2
11
DISPLAY/SW
ASSY
1
26
24
23
27
22
29
21
25
30
7
14
7
7
4
28
14

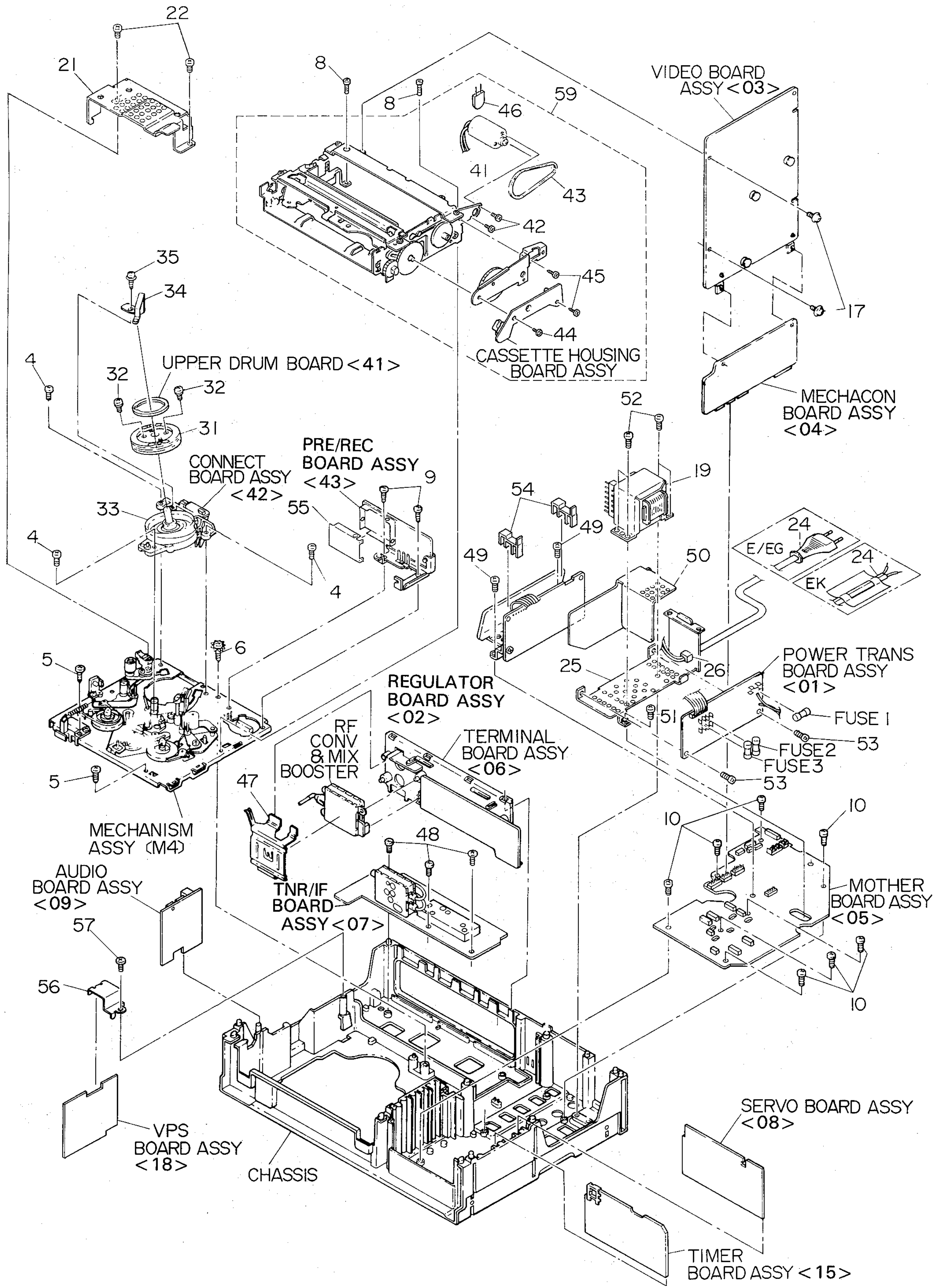
2. CABINET ASSEMBLY <M2>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	1	PQ10487B-8	FRONT PANEL ASSY,(EG)INCL21-30
		PQ10487F-9	FRONT PANEL ASSY,(E).INCL21-30
		PQ10487E-9	FRONT PANEL ASSY,(EK)INCL21-30
	2	PQ31335-4	FDP FILTER
⚠	3	PQ10328-20	TOP COVER
⚠	4	PQ10330-1-6	BOTTOM COVER
	5	SDSA4014M	TAPPING SCREW,X4.TOP COVER
	6	SDSF3010M	TAPPING SCREW
	7	SDSF3010Z	TAPPING SCREW,X3.BUTTON COVER
	8	PQ31267-84	C.HOUSING DOOR
	9	PQ42410-1-1	TORSION SPRING
	10	SDSF2608Z	TAPPING SCREW,X8T/DESP/OPBOARD
	11	PQ42353	MEMORY BUTTON
	12	PQ42636-1-1	EARTH BRACKET
	13	PQ31214-1-1	VOLUME KNOB,X2
	14	PU57662-1-1	FOOT,X2
	21	PQ20440-5-2	COVER(OPE),(E/EK)
		PQ20440-1-2	COVER(OPE),(EG)
	22	PQ20441-1-2	BUTTON(OPE),(E/EK)
		PQ20441-2-2	BUTTON(OPE),(EG)
	23	PQ31722-1-1	BUTTON(POWER)
	24	PQ43039	INDICATOR(POWER
	25	PQ31209N	DOOR ASS'Y(EG)
		PQ31209U	DOOR ASS'Y,(E)
		PQ31209T	DOOR ASS'Y,(EK)
	26	PQ31384-7	PROGRAM BUTTON,(EK)
		PQ31384-3	PROGRAM BUTTON,(EG)
		PQ31384-8	PROGRAM BUTTON,(E)
	27	PQ31206	COUNTER BUTTON
	28	PQ31212-9	BUTTON COVER(R),(EG)
		PQ31212-10-10	BUTTON COVER(R),(E/EK)
	29	PQ31213	TEN KEY BUTTON
	30	PQ31213-2	TEN KEY BUTTON

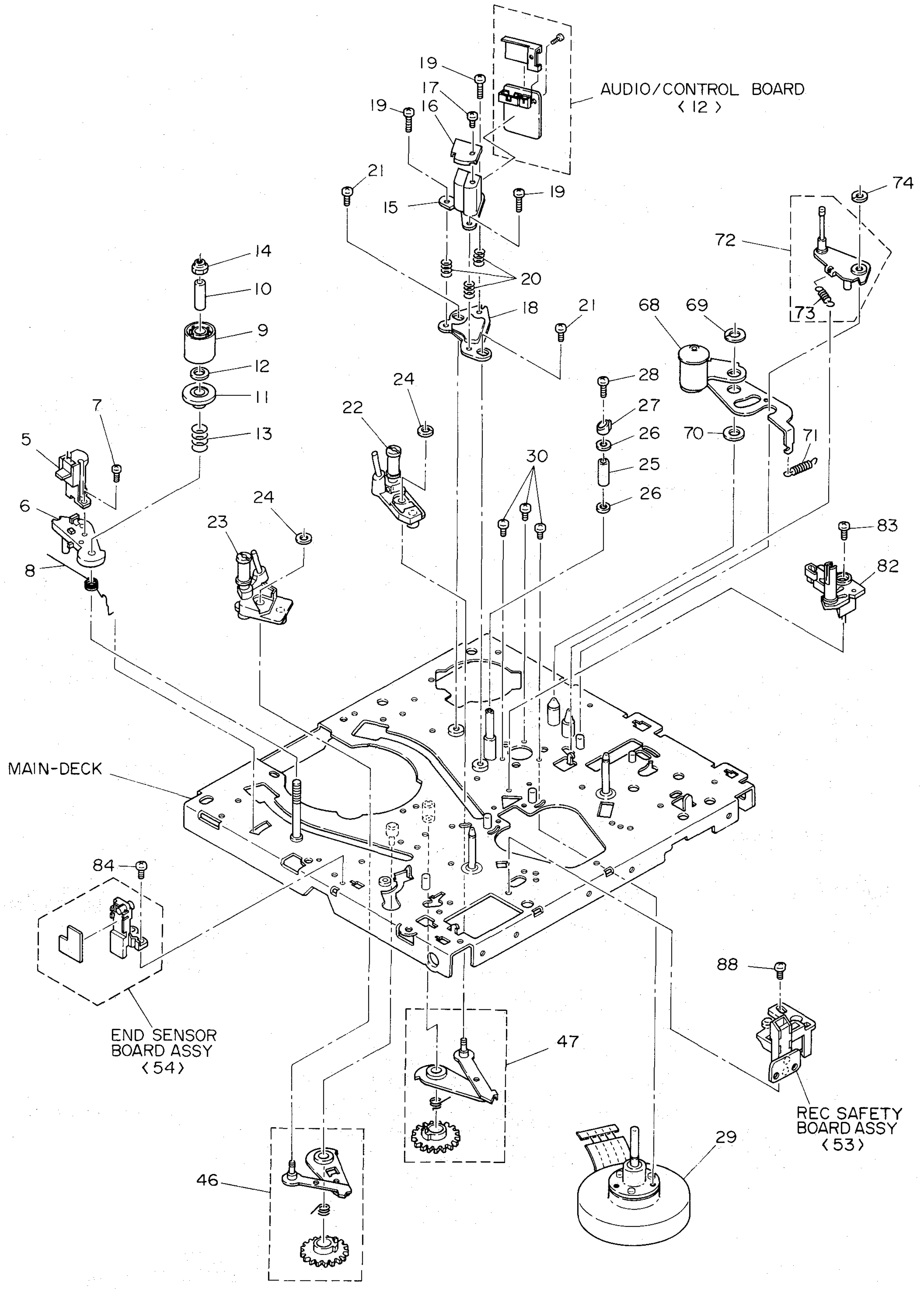
3. CHASSIS ASSEMBLY <M3>

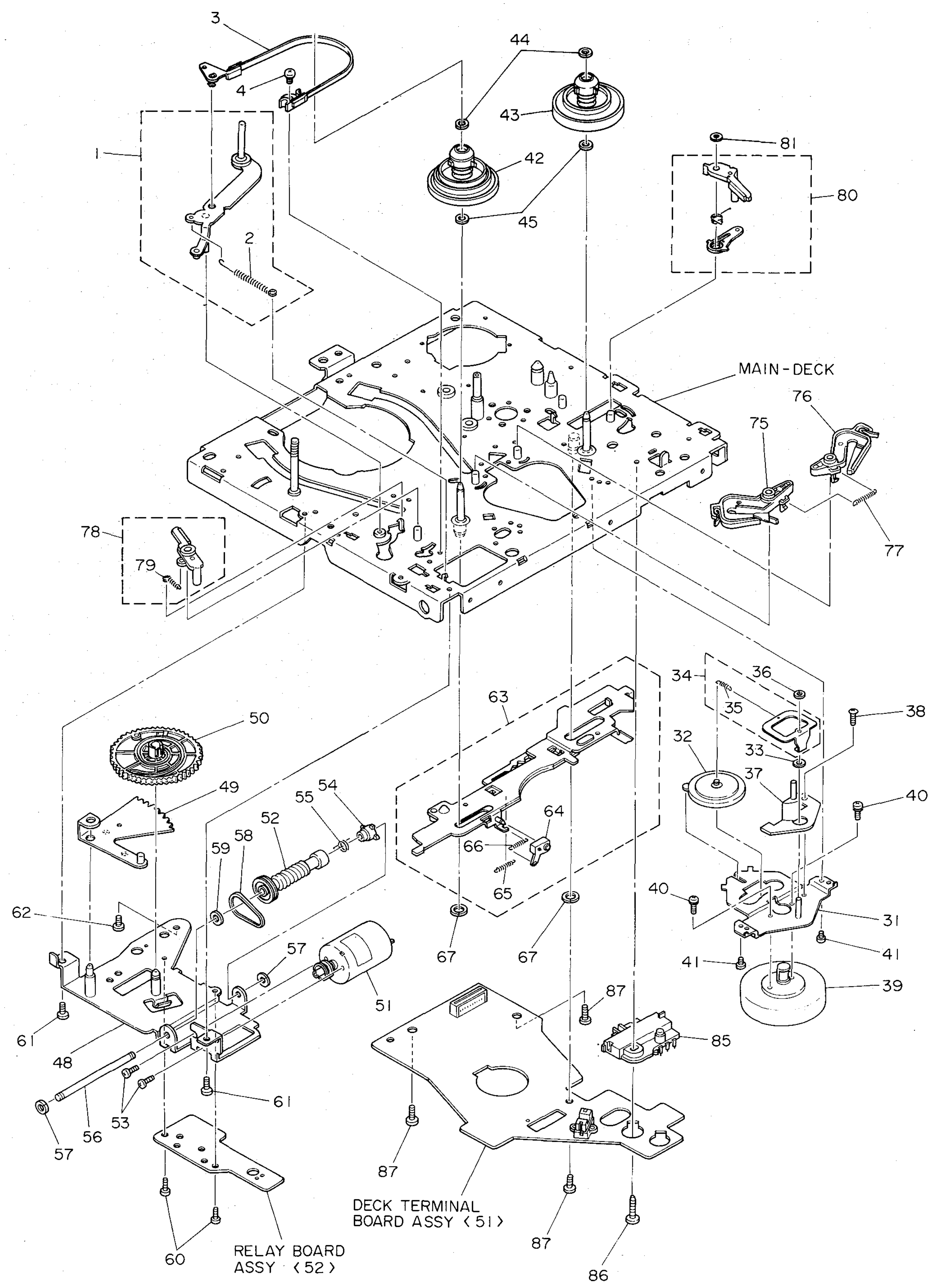
#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	4	SDSP2608Z	SCREW,X3.FOR DRUM
	5	**SDSA4014Z**	**TAPPING SCREW,X2.M.DECK**
	6	PQ41396	SPECIAL SCREW, M.DECK
	8	SDST2605Z	TAPPING SCREW,X2.C.HOUSING
	9	SDST2605Z	TAPPING SCREW,X2.PRE AMP
	10	SDSF3010Z	TAPPING SCREW,X7.MOTHER BOARD
	17	GPST2606Z	TAPPING SCREW,X2.V/M/S BOARD
⚠	19	PU59383	POWER TRANSFORMER
⚠		PU59212-3	POWER TRANSFORMER,(E/EG)
	21	PQ31171-2-4	DRUM SHIELD
	22	SDST2605Z	TAPPING SCREW,X2. DRUM SHIELD
⚠	24	QMP5140-200	POWER CORD, (EK)
⚠		QMP3980-200	POWER CORD, (E/EG)
⚠	25	PQ31201	TRANS BRACKET
⚠	26	QHS3771-108	STRAIN RELIEF
	31	PDM2004B	UPPER DRUM ASSY
	32	PDM4001A	DRUM SCREW ASSY,X2
	33	PDM2053E-4	LOWER DRUM MOTOR ASSY
	34	PDM4017A-2	BRUSH ASSY
	35	DPSP2606Z	SCREW
⚠	41	PQ42385A	CASSETTE MOTOR ASSY, (EG/EK)
⚠	OR	PQ42385B	CASSETTE MOTOR ASSY, (E)
	42	SPSP2603Z	SCREW, X2
	43	PQM30003-19	BELT
	44	SPSP2604Z	SCREW
	45	SPST2605Z	TAPPING SCREW, X2
	46	DV710SR223M16	VARISTOR
	47	PQ31242	EARTH SPRING
	48	SDSF3010Z	TAPPING SCREW,X3.TU/IF BOARD
	49	SDSF3012Z	TAPPING SCREW,X2.HEART SINK
⚠	50	PQ31241-2-4	AC COVER
	51	SDST3006C	TAPPING SCREW.EARTH
	52	SDSA4014Z	TAPPING SCREW,X4 TRANS
	53	SDST3006Z	TAPPING SCREW, TRANS BRACKET
	54	PQ42733-1-2	PWB HOLDER
	55	PU59082	PRE SHIELD (3)
	56	PQ43184	BRACKET. FOR VPS BOARD
	57	SDSF3010Z	TAPPING SCREW. FOR VPS BOARD
	59	PUS28277H	CASS.HOUSING ASSY,INCL41-46

4.3 CHASSIS ASSEMBLY <M3>


22
21
8
8
46
59
VIDEO BOARD ASSY <03>
41
43
42
45
17
44
35
34
CASSETTE HOUSING BOARD ASSY
UPPER DRUM BOARD <41>
4
32
32
31
MECHACON BOARD ASSY <04>
52
CONNECT BOARD ASSY <42>
PRE/REC BOARD ASSY <43>
9
55
33
54
19
49
49
24
E/EG
24
EK
50
4
4
6
5
5
25
26
POWER TRANS BOARD ASSY <01>
REGULATOR BOARD ASSY <02>
51
FUSE 1
FUSE2
FUSE3
53
53
RF CONV & MIX BOOSTER
TERMINAL BOARD ASSY <06>
47
48
10
10
MECHANISM ASSY (M4)
AUDIO BOARD ASSY <09>
TNR/IF BOARD ASSY <07>
MOTHER BOARD ASSY <05>
57
10
56
SERVO BOARD ASSY <08>
VPS BOARD ASSY <18>
CHASSIS
TIMER BOARD ASSY <15>

4.4 MECHANISM ASSEMBLY <M4>


AUDIO/CONTROL BOARD
< 12 >
19
17
16
19
21
15
19
14
10
9
12
11
13
20
18
21
7
5
6
8
24
22
23
24
30
28
27
26
25
26
68
69
70
71
72
73
74
83
82
MAIN-DECK
84
END SENSOR
BOARD ASSY
< 54 >
47
46
29
88
REC SAFETY
BOARD ASSY
< 53 >

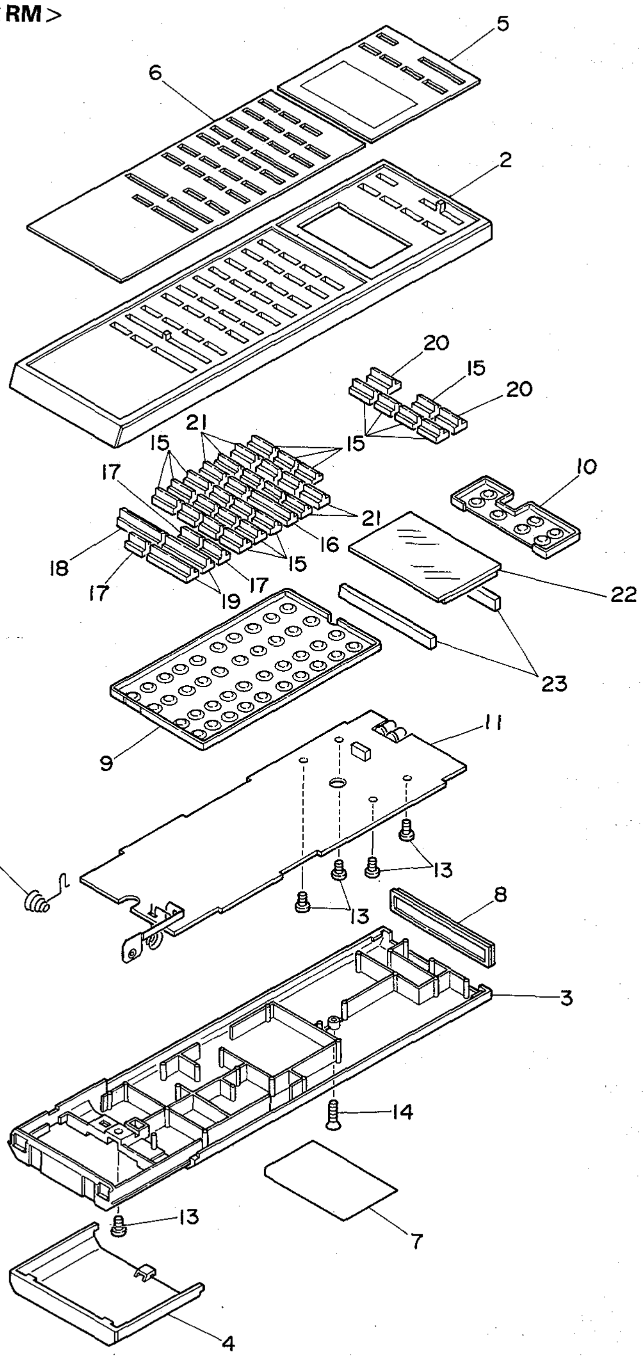

3
4
44
43
42
45
1
2
81
80
MAIN-DECK
76
75
77
78
79
50
49
63
34
36
35
33
38
32
37
40
55
54
52
58
59
64
66
65
67
67
62
40
31
41
41
57
51
39
87
85
61
48
53
56
57
61
60
87
87
86
DECK TERMINAL
BOARD ASSY < 51 >
RELAY BOARD
ASSY < 52 >

****

* 4. MECHANISM ASSEMBLY <M4> *

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	1	PQ41944A-7	TENSION ARM ASSY, INCL.2
	2	PQ41952-3	SPRING
	3	PQ41948A	TENSION BAND ASSY
	4	SDST2606Z	TAPPING SCREW
	5	PU57641-2	FULL ERASE HEAD
	6	PQ31036	FULL ERASE HEAD BASE
	7	SPSG2606Z	SCREW
	8	PQ41954-1-1	TORSION SPRING
	9	PQ41955	IMPEDANCE ROLLER
	10	PQ41956	COLLAR
	11	PQ41957	LOWER FLANGE
	OR	PQ42958	LOWER FLANGE
	12	PQM30018-39	SPACER
	OR	PQM30018-50	SPACER
	13	PQM30002-124	COMPRESSION SPRING
	14	PQ40353	NYLON NUT
	15	PU59253	AUDIO/CONTROL HEAD
	16	PU55535	SHIELD CAP
	17	HPSP2015N	SCREW
	18	PQ42984-1-3	HEAD BASE
	19	SPSP2608Z	SCREW,X3
	20	PU30080-49	SPRING,X3
	21	SDSP2606Z	SCREW,X2
	22	PQ41963A-1	POLE BASE ASSY(TU)
	OR	PU59994	POLE BASE ASSY(TU)
	23	PQ41969A-1	POLE BASE ASSY(SUP)
	OR	PU59993	POLE BASE ASSY(SUP)
	24	PQM30017-5	SLIT WASHER,X2
	25	PU53629-2	TAPE GUIDE
	26	PQ40268-2	GUIDE FLANGE,X2
	27	PQ42999-2	G.POLE CAP
	28	SDSP2006Z	SCREW
⚠	29	PU58635V	CAPSTAN MOTOR
	30	SPSP2605N	SCREW,X3
	31	PQ41974A-3	REEL MOTOR BRACKET ASSY
	32	PU58645-1-4	IDLER ARM
	33	Q03093-834	WASHER
	34	PQ41976A-1	SPRING ARM ASSY,INCL.35
	35	PQ42212-1-4	SPRING
	36	PQM30017-22	SLIT WASHER
	37	PQ41978	HOLDER
	38	SPST2606Z	TAPPING SCREW
⚠	39	PU58636W	REEL MOTOR
	OR	PU58636M	REEL MOTOR,
	40	LPSP2604Z	SCREW, X2
	41	SPST2606Z	TAPPING SCREW, X2
	42	PU59250-1-2	REEL DISK(SUP)
	43	PU58638-1-2	REEL DISK(TU)
	44	PQM30017-5	SLIT WASHER, X2
	45	Q03093-828	WASHER, X2
	46	PQ41979A-4	LOADING ARM ASSY(SUP)
	47	PQ41985A-2	LOADING ARM ASSY(TU)
	48	PQ41992A-1	CAM BRACKET SUB ASSY
	49	PQ41994A-2	ARM GEAR SUB ASSY
	50	PQ20250-1-1	CONTROL CAM
	51	PQ41996A	MODE MOTOR ASSY
	52	PQ41998A	WORM ASSY
	53	LPSP2604Z	SCREW,X2
	54	PQ42001	WINDMILL
	55	PQ42002	CLUTCH SPRING
	56	PQ42003	WORM SHAFT
	57	PQM30017-5	SLIT WASHER,X2
	58	PQM30003-17	BELT
	59	PQM30018-22	SPACER
	60	SPST2606Z	SCREW,X2
	61	SPST2606Z	SCREW,X2
	62	SPSP2603Z	SCREW
	63	PQ42038A-3	PLATE ASS'Y, INCL 64-66
	64	PQ31044-1-2	LOCK LEVER
	65	PQM30001-191	TENSION SPRING
	66	PQM30001-211	TENSION SPRING
	67	PQM30017-28	SLIT WASHER,X2
	68	PQ42006B	PINCH ROLLER ARM ASSY
	69	PQM30017-28	SLIT WASHER
	70	Q03093-833	WASHER
	71	PQM30001-193	TENSION SPRING
	72	PQ42013B-4	GUIDE ARM ASSY,INCL.73
	73	PQ42029	SPRING
	74	PQM30017-6	SLIT WASHER
	75	PQ42019A-3	MAIN BRACKET ASSY(SUP)
	76	PQ42020B	MAIN BRACKET ASSY(TU)
	77	PQM30001-216	TENSION SPRING
	78	PQ42021A-3	SUB BRAKE ASSY(SUP),INCL.79
	79	PQ42023-1-2	TENSION SPRING
	80	PQ42037A-2	SUB BRAKE ASSY(TU)
	81	PQM30017-6	SLIT WASHER
	82	PU59452	LED HOLDER
	OR	PU58640	LED HOLDER
	83	SPST2606Z	TAPPING SCREW
	84	SPST2606Z	TAPPING SCREW
	85	PU58642	SLIDE ENCODER
	86	SDSP2610Z	SCREW
	87	SDSP2606Z	SCREW,X3
	88	SDST2606Z	TAPPING SCREW

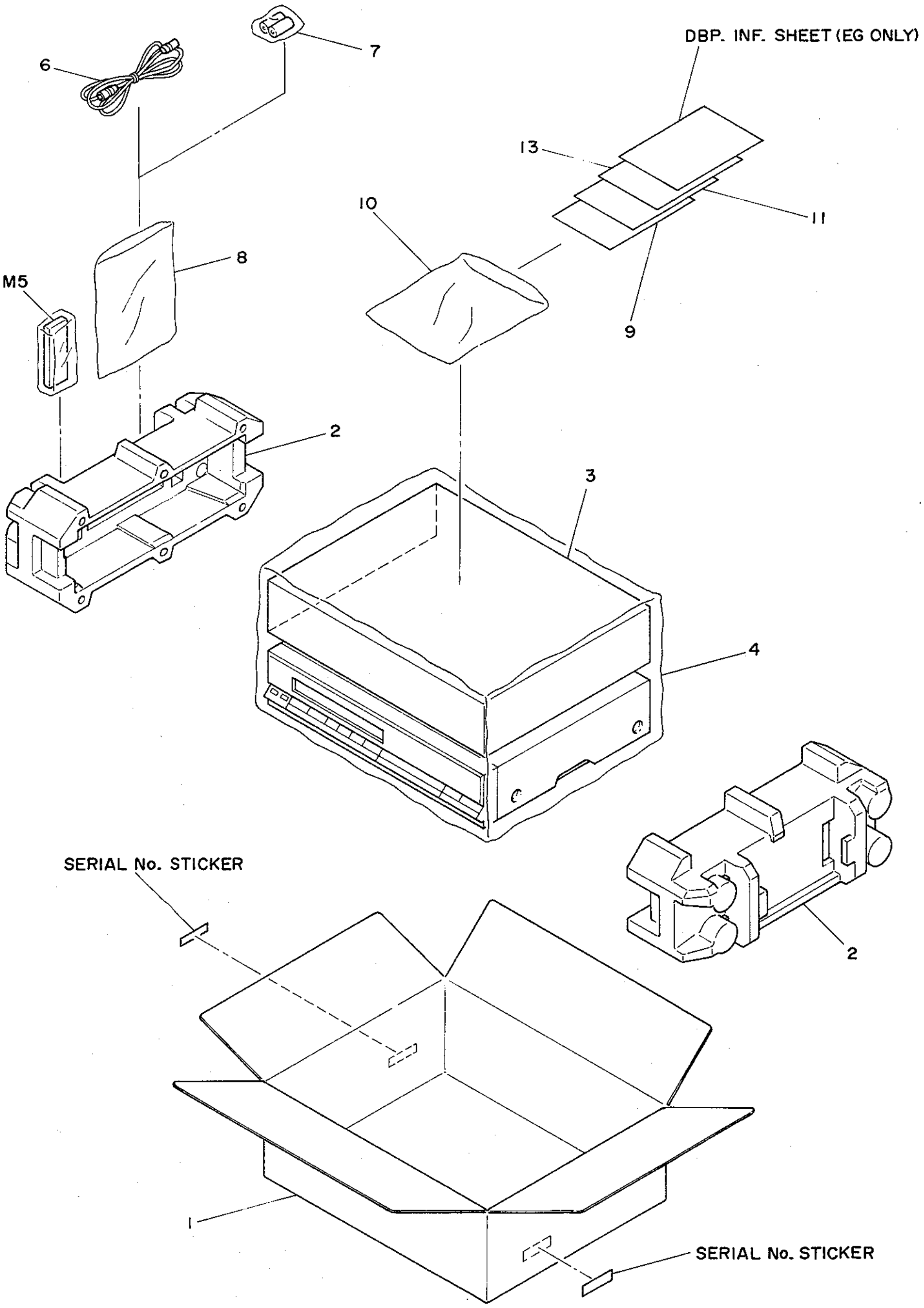
4.5 REMOTE CONTROL UNIT <RM>



```
***************************************************************
    *****************************************************
    *      5. REMOTE CONTROLLER ASSEMBLY <M5>          *
    *****************************************************
```

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	1	PQ10543E	REMO. CONTROLLER, (E), INCL. 2-23
		PQ15043D	REMO. CONTROLLER, (EK), INCL. 2-23
		PQ10543B	REMO. CONTROLLER, (EG), INCL. 2-23
	2	PQ31909	UPPER CASE
	3	PQ31910	LOWER CASE
	4	PQ31449	BATTERY CAP
	5	PQ31911-3	L.C.D. WINDOW, (E/EK)
		PQ31911-2	L.C.D. WINDOW, (EG)
	6	PQ31912-5	TOP PANEL, (E)
		PQ31912-4	TOP PANEL, (EK)
		PQ31912-2	TOP PANEL, (EG)
	7	PU36139-53	REMOCON LABEL, (E)
		PU36139-52	REMOCON LABEL, (EK)
		PU36139-49	REMOCON LABEL, (EG)
	8	PQ10543-003	WINDOW
	9	PQ10543-004	RUBBER SHEET (L)
	10	PQ10543-005	RUBBER SHEET (S)
	11	PQ10543-001	REMOCON BOARD ASSY, (E/EG)
		PQ10543-002	REMOCON BOARD ASSY, (EK)
	12	PQ10355-009	BATTERY TERMINAL
	13	SDSP2005M	SCREW, x5
	14	SSSP201M	SCREW
	15	PQ10543-006	BUTTON, BLACK x16
	16	PQ10543-007	BUTTON, SAME BLACK (L)
	17	PQ10543-008	BUTTON, GRAY (S) x3
	18	PQ10543-009	BUTTON, RED
	19	PQ10543-010	BUTTON, GRAY (L) x2
	20	PQ10543-011	BUTTON, BLUE x2
	21	PQ10543-012	BUTTON, SAME BLACK x10
	22	PQ10543-013	L.C.D., (E/EK)
		PQ10543-014	L.C.D., (EG)
	23	PQ10543-015	CONNECTER, x2

4.6 PACKING ASSEMBLY <M1>


6
7
DBP. INF. SHEET (EG ONLY)
13
10
11
8
M5
9
2
3
4
SERIAL No. STICKER
2
1
SERIAL No. STICKER

1. PACKING ASSEMBLY <M1>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	1	PQ31705-4	PACKING CASE,(EG)
		PQ31705-12	PACKING CASE,(E)
		PQ31705-11	PACKING CASE,(EK)
	2	PQ31706A-1	CUSHION ASSY
	3	PQ41026-8	PROTECT SHEET
⚠	4	**PUP30320-26-12**	**POLY BAG,(EK)**
		PQM30021-59-11	POLY BAG,(E/EG)
⚠	6	PU59168-3	RF CABLE
⚠	OR	PU59167-3	RF CABLE
	7	UM-3DJ2P	BATTERY
⚠	8	PQM30023-8	POLY BAG,(EK)
		QPGA020-02003	POLY BAG,(E/EG)
⚠	9	PU30425-922	INSTRUCTIONS,(E)
⚠		PU30425-920	INSTRUCTIONS,(EK)
⚠		PU30425-919	INSTRUCTIONS,(EG)
	10	QPGA025-03505	POLY BAG,(E/EG)
⚠		PQM30023-5	POLY BAG,(EK)
	11	BT-20069A	WARRANTY CARD,(EG)
		BT-20060	GUARANTY CARD,(EK)
	13	BT-20066	E.DISTRI.LIST,(EK)

SECTION 5
PARTS LIST

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS:

RESISTORS—All resistance values are in ohms (Ω), unless otherwise indicated.

k	: 1,000 (Kilo)
M	: 1,000,000 (Mega)
Chip R	: Chip Resistor
Chip VR	: Chip Variable Resistor
Comp. R	: Composition Resistor
CR	: Carbon Film Resistor
FR	: Fusible Resistor
MFR	: Metal Film Resistor
MPR	: Metal Plate Resistor
OMR	: Oxide Metal Film Resistor
PMR	: Precision Metal Film Resistor
UFR	: Unflammable Resistor
VR	: Variable Resistor (Potentiometer)
WR	: Wire Wound Resistor

CAPACITORS—All capacitance values are in μF, unless otherwise indicated.

pF	: μμF (Pico farad)
C Cap	: Ceramic Capacitor
Chip Cap	: Chip Capacitor
Chip T Cap	: Chip Tantalum Capacitor
E Cap	: Electrolytic Capacitor
FM Cap	: Film Mica Capacitor
LL Cap	: Low Leak Current Electrolytic Capacitor
MM Cap	: Metalized Mylar Capacitor
MP Cap	: Metalized Paper Capacitor
MY Cap	: Mylar Capacitor
NP Cap	: Non-polar Capacitor
PC Cap	: Polycarbonate Capacitor
PP Cap	: Polypropylene Capacitor
PS Cap	: Polystyrol Capacitor
T Cap	: Tantalum Capacitor
TF Cap	: Thin Film Capacitor
TR Cap	: Trimmer Capacitor

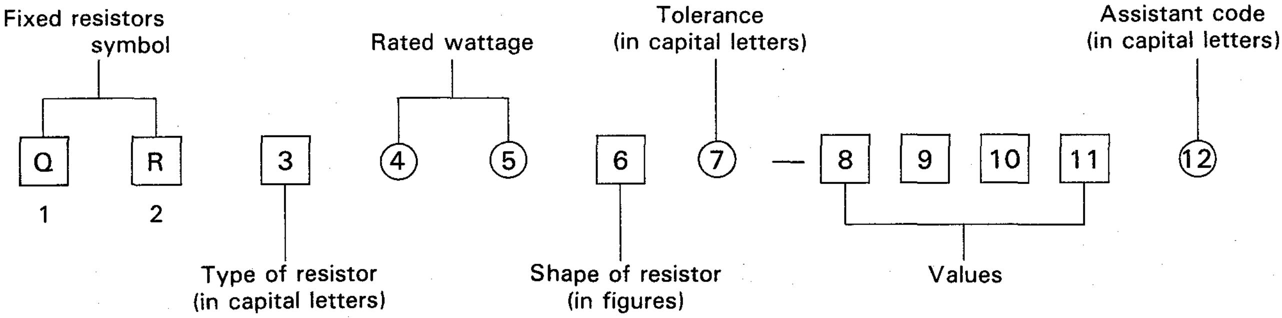
NOTES:

- [M] indicates mechanical symbol number.
- [2 digits] indicates circuit board symbol number.
- "X " indicates quantity per set.

5.1 STANDARD PART NUMBER CODING

5.1.1 Fixed resistor coding

Fixed resistor part numbers are as follows.


Fixed resistors symbol
Rated wattage
Tolerance (in capital letters)
Assistant code (in capital letters)
Q
R
3
④
⑤
6
⑦
—
8
9
10
11
⑫
1
2
Type of resistor (in capital letters)
Shape of resistor (in figures)
Values

Type of resistor (third digit)

C	Composition resistors
D	Carbon film resistors
F	Unflammable resistors
G	Oxide metal film resistors
H	Fusible resistors
M	Metal plate resistors
S	Metal glazed resistors
V	Precision metal film resistors
W	Wire wound resistors
X	Metal film resistors
Z	Special resistors

Rated wattage (fourth and fifth digits)

A0	1/10 W
18	1/8 W
16	1/6 W
14	1/4 W
12	1/2 W
01	1 W
02	2 W
03	3 W
04	4 W
05	5 W
06	6 W
07	7 W
75	7.5 W
08	8 W
10	10 W
15	15 W
A6	16 W
20	20 W
30	30 W

Tolerance (seventh digit)

F	±1 %
G	±2 %
J	±5 %
K	±10 %
M	±20 %

Assistant code (twelfth digit)

A	Small type
B	Small type
S	Small type
Y	Lead tapping
Z	Lead tapping

Values (eighth — tenth or eleventh digits)

examples:

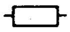
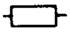
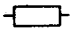
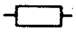
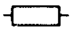
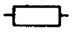
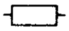
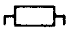
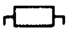
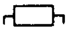
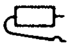
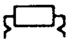
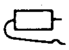
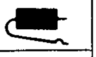
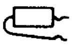
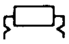
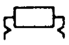
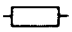
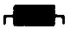
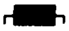
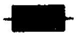
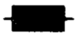
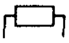
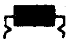
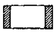
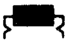
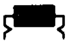
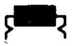
R47		0.47 Ω
4R7		4.7 Ω
470	47×10^{0}	47 Ω
471	47×10^{1}	470 Ω
472	47×10^{2}	4.7 kΩ
473	47×10^{3}	47 kΩ
474	47×10^{4}	470 kΩ
475	47×10^{5}	4.7 MΩ

QRV resistance shown by four digits:

4640	464×10^{0}	464 Ω
4641	464×10^{1}	4.64 kΩ
4642	464×10^{2}	46.4 kΩ

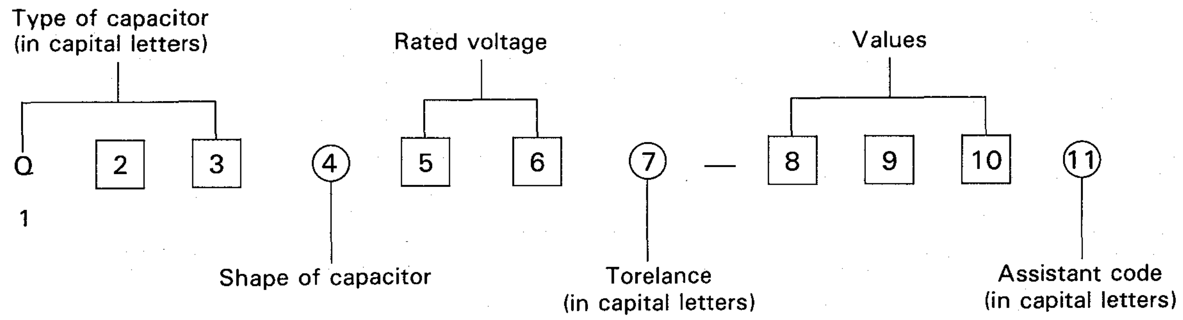
Shape of resistor (sixth digit)

Note: ■ indicates flame retardant resistor.

Type of resistor / Shape of resistor	C	D	F	G	H	M	S	V	W	X
1										
2										
3										
4										
5									(L) type	
6										
7			Lug (B) type							
8			Lug (A) type				 Chip			
9			Lug (C) type							

5.1.2 Fixed capacitor coding

Fixed capacitor part numbers are as follows.


Type of capacitor
(in capital letters)
Rated voltage
Values
Q
2
3
4
5
6
7
—
8
9
10
11
1
Shape of capacitor
Torelance
(in capital letters)
Assistant code
(in capital letters)

Ceramic capacitors

Type of capacitor (first — third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Mono-direction	Kink lead	Axial lead	Axial forming lead	Chip
QCC	Ceramic	1		4	5	
QCD	High capacitance					A
QCF	High capacitance	1,4	3			8,A
QCS	Temperature compensation	1	3	4	5	8,A
QCT	Temperature compensation	Special coding				8,A
QCV	Ceramic			1	3	
QCX	Ceramic			1	3	
QCY	High capacitance	1,4	3	6	7	8,A
QCZ	Special type	Special coding				
QCB	Ceramic			B	C	

Electrolytic capacitors

Type of capacitor (first — third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEB	Low leakage		4	5	6	
QEC	Low leakage		4,8,A	9,B	6,C	
QEE	Tantalum (normal)		4	5	6	
	Tantalum (small)		8			
QEF	Chip tantalum	8 (chip type)				
QEG	Low impedance		4			
QEK	Miniature type		4	5	6	
QEL	Small type		4	5	6	7
QEM	Small type		4,A	5	6	
QEN	Non-polar	2	4	5	6	
QEP	Non-polar (small)		4,A	5,B	6,C	
QER	Miniature type		4	5	6	
QET	Small type	2	4,A	5,B	6,C	7
QEU	Small type		4	5	6	
QEV	Small type		4		6	7
QEW	Normal	2	4	5	6	7

Paper film capacitors

Type of capacitor (first — third digits)		Shape of capacitor (fourth digit)				
		Tubular	Normal		Flame retardant	
Symbol	Characteristics		Mono-direction	Kink lead	Mono-direction	Kink lead
QFA	Metalized polypropylene				7	
QFE	Metalized mylar				5	
QFF	Film mica		4			
QFG	Polypropylene film		4	8		
QFH	Metalized mylar	2	4	3	5,7	6
QFJ	Mylar (special)		4			
QFK	Metalized mylar (small)				5	
QFM	Mylar	2	4	3,7	5	6
QFN	Mylar (small)		4	3		
QFP	Polypropylene		4	3,8		
QFS	Polystyrole	2	4	3		
QFV	Thin film		4	8		
QFZ	Special type	Special coding				

Rated voltage (fifth and sixth digits)

Sixth digit / Fifth digit	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15	4.0		6.3				
1	10		16	20	25		40	50	63	80	35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

Tolerance (seventh digit)

A	$^{+100}_{-10}$ %	M	± 20 %
F	± 1 %	N	± 30 %
G	± 2 %	P	$^{+100}_{-0}$ %
H	$^{+50}_{-10}$ %	R	$^{+30}_{-10}$ %
J	± 5 %	X	$^{+40}_{-20}$ %
K	± 10 %	Z	$^{+80}_{-20}$ %

Values (eighth — tenth digits)

Example : Values are in picofarads

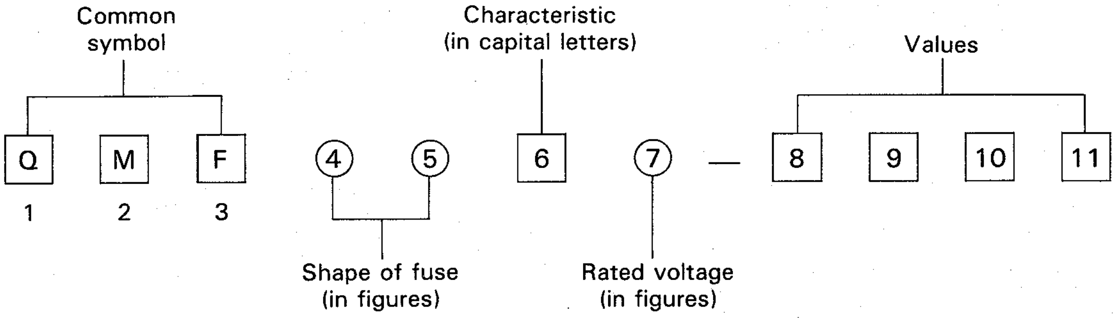
101 .... 10×10^1 pF .... 100 pF
102 .... 10×10^2 pF .... 1,000 pF (0.001 μF)
103 .... 10×10^3 pF .... 10,000 pF (0.01 μF)
104 .... 10×10^4 pF .... 100,000 pF (0.1 μF)
105 .... 10×10^5 pF .... 1 μF
5R0 .... 5.0 pF

Assistant code (eleventh digit)

G Small size
Z Lead tapping
Y Lead tapping

5.1.3 Fuse coding

Standard fuse part numbers are as follows.


Common symbol
Characteristic (in capital letters)
Values
Q
M
F
④
⑤
6
⑦
—
8
9
10
11
1
2
3
Shape of fuse (in figures)
Rated voltage (in figures)

Shape of fuse
(fourth and fifth digits)

51	ϕ5.2×20 mm
60	ϕ6.4×30 mm
61	ϕ6.35×31.8 mm
63	ϕ6.4×30 mm with lead wires
66	ϕ6.35×31.8 mm with lead wires
00	Special type

Rated voltage
(seventh digit)

1	AC125 V
2	AC250 V
3	0.1–1 A : AC250 V 1.25–6.3 A : AC125 V

Values
(eighth-tenth or eleventh digits)
example:

R63	.... 0.63 A
1R0	.... 1.0 A
2R5	.... 2.5 A
100	.... 10 A
R315	.... 0.315 A
1R25	.... 1.25 A

Characteristics (sixth digit)

Symbol	Fusing Current	Fusing Time	Remarks
A	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 – 10 sec.	
	400 %	0.15 – 3 sec.	
	1000 %	0.02 – 0.3 sec.	
B	210 %	Within 30 min.	Regular fusible type (for SEMKO, Europe)
	275 %	0.05 – 2 sec.	
	400 %	0.01 – 0.3 sec.	
C	135 %	Within 1 hr.	Regular fusible type (for UL, Japan)
	200 %	Within 2 min.	
E	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 – 10 sec.	
	400 %	0.15 – 3 sec.	
	1000 %	0.02 – 0.3 sec.	
J	135 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
M	135 %	Within 1 hr.	Regular fusible type (for UL)
	200 %	Within 2 min.	
R	160 %	Within 1 hr.	Regular fusible type
	200 %	Within 2 min.	
S	160 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
	700 % – 2000 %	Within 0.01 sec.	
U	135 %	Within 1 hr.	Anti-rush type (for UL)
	200 %	Within 2 min.	
	800 % – 2000 %	Within 0.01 sec.	

POWER SUPPLY BOARD ASSEMBLY <01><02>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22560B-02	POWER SUPPLY BOARD ASSY,EK
		PU22560A-02	POWER SUPPLY BOARD ASSY,E/EG
⚠	TAB	A74316	TAB, FOR AC IN
	FW1	PW30106-50AAZZA	PARALLEL WIRE
⚠	F1	QMF51E2-R315	FUSE,NOT INCL.POWER TRA BOARD
⚠	F2	QMF51E2-2R5	FUSE,NOT INCL.POWER TRA BOARD
⚠	F3	QMF51E2-1R0	FUSE,NOT INCL.POWER TRA BOARD

-POWER TRANSFORMER BOARD ASSY < 01 >-

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22560B1-02	POWER TRANS BOARD ASSEMBLY,EK
		PU22560A1-02	POWER TRANS BOARD ASSY ,E/EG
	D1	10E2	DIODE
	D2	10E2	DIODE
	D4	ERA15-02	DIODE
	OR	1SR35-200A	DIODE
	OR	S5688G	DIODE
	OR	11E2	DIODE
	D5	ERA15-02	DIODE
	OR	1SR35-200A	DIODE
	OR	S5688G	DIODE
	OR	11E2	DIODE
	DS1	S4VB10	BRIDGE DIODE
	R2	QRZ0052-100	FUSIBLE RESISTOR
	C1	QFK52AK-473	M CAPACITOR
	C2	QETB1EM-228	E CAPACITOR
	C3	QETB1EM-478	E CAPACITOR
	C4	QETB1CM-478	E CAPACITOR
	C5	QETB1JM-476	E CAPACITOR
	C7	QETC1JM-107	E CAPACITOR
	OR	QETB1JM-107	E CAPACITOR
⚠	C101	QCZ9016-472P	CAPACITOR
⚠	HD	PU57505	FUSE CLIP,X6 FOR F1,F2,F3
⚠	LF1	PU59581	LINE FILTER, E/EG
⚠	LF2	PU59586	LINE FILTER, E/EG

-REGULATOR BOARD ASSEMBLY < 02 >-

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22560B2-02	REGULATOR BOARD ASSEMBLY,EK
		PU22560A2-02	REGULATOR BOARD ASSEMBLY,E/EG
	IC1	STK5481	IC
	Q1	2SA720Q,R,S	TRANSISTOR
	Q2	2SA720Q,R,S	TRANSISTOR
	D6	HZ30-2	ZENER DIODE
	D11	MA165	DIODE,E/EG
	OR	1SS133	DIODE,E/EG
	D12	1SS133	DIODE
	OR	MA165	DIODE
	D13	MA161	DIODE
	R3	QRD181J-822	RESISTOR
⚠	R4	QRZ0052-221	FUSIBLE RESISTOR
	R5	QRD181J-222	RESISTOR
	R6	QRD181J-272	RESISTOR
	R7	QRD181J-682	RESISTOR
	R8	QRD181J-223	RESISTOR
	R10	QRD181J-102	RESISTOR
	R11	QRD181J-104	RESISTOR
	C6	QETC1HM-106	E CAPACITOR
	OR	QET61HM-106	E CAPACITOR
	C8	QETA1HM-226	E CAPACITOR
	OR	QET41HM-226	E CAPACITOR
	C9	QETC1HM-106	E CAPACITOR
	OR	QET61HM-106	E CAPACITOR
	C10	QETC1CM-476	E CAPACITOR
	C12	QETC1CM-107	E CAPACITOR
	C13	QETC1CM-476	E CAPACITOR
	C14	QETC1CM-107	E CAPACITOR
⚠	HS	PQ31187	HEAT SINK
	TAB	A74017	TAB
	SCW1	SDST3014Z	TH.TAP SCREW, FOR IC1
	SCW2	SDST3006Z	SCREW, FOR HEAT SINK
	TP	PU55774	TEST PIN
	CN1	PU58931-14	CAP HOUSING
	CP1	ICP-F10	CIRCUIT PROTECTOR
	CP2	ICP-F15	CIRCUIT PROTECTOR
⚠	CP3	ICP-F15	CIRCUIT PROTECTOR
⚠	CP4	ICP-F20	CIRCUIT PROTECTOR

MAIN BOARD ASSEMBLY <03><04>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PB10043A-02	MAIN BOARD ASSEMBLY ,E/EG
		PB10043B-02	MAIN BOARD ASSEMBLY ,EK
	HN	PU57951	TU PWB HINGE
	RV	PU52105	P RIVET
	J1	PW30109-50AAZZ6	PARALLEL WIRE
	J2	PW30109-50AAZZB	PARALLEL WIRE
	SPC1	PQ41028-2	SPACER
	SPC2	PQM30029-100	SPACER

-VIDEO BOARD ASSEMBLY < 03 >-

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA1	PB10043A1	VIDEO BOARD ASSEMBLY ,E/EG
		PB10043B1	VIDEO BOARD ASSEMBLY,EK
	IC101	PU22282A	Y.MODULE BOARD ASSY
	IC102	7VT12	IC
	IC201	TA7374P	IC
	IC202	MSM6989RS	IC
⚠	IC301	PU22046A	C.MODULE BOARD ASSY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	IC351	BA7007	IC, E/EG
	IC401	AN3592K	IC
	Q101	2SC1740S(QRS)	TRANSISTOR
	Q102	2SC1740S(QRS)	TRANSISTOR
	Q104	2SC1740S(QRS)	TRANSISTOR
	Q105	2SC1740S(QRS)	TRANSISTOR
	Q106	2SC1740S(QRS)	TRANSISTOR
	Q111	2SC1740S(QRS)	TRANSISTOR
	Q112	2SA933S(RS)	TRANSISTOR
	Q113	2SA933S(RS)	TRANSISTOR
	Q201	DTC124ES	TRANSISTOR
	Q202	DTC124ES	TRANSISTOR
	Q203	DTC124ES	TRANSISTOR
	Q204	DTC124ES	TRANSISTOR
	Q208	2SC1740S(QRS)	TRANSISTOR
	Q209	2SC1740S(QRS)	TRANSISTOR
	Q210	2SC1740S(QRS)	TRANSISTOR
	Q211	2SA1309R,S	TRANSISTOR
	Q212	2SC1740S(QRS)	TRANSISTOR
	Q213	2SC1740S(QRS)	TRANSISTOR
	Q215	2SC1740S(QRS)	TRANSISTOR
	Q216	DTC124ES	TRANSISTOR
	Q217	DTC144WS	TRANSISTOR
	Q301	2SC1740S(QRS)	TRANSISTOR
	Q302	2SC1740S(QRS)	TRANSISTOR
	Q311	DTC124ES	TRANSISTOR
	Q312	DTC124ES	TRANSISTOR
	Q313	DTC144ES	TRANSISTOR
	Q314	DTC144ES	TRANSISTOR
	Q315	DTC144WS	TRANSISTOR
	Q316	DTC144ES	TRANSISTOR
	Q317	2SC1740S(QRS)	TRANSISTOR
	Q318	2SC1740S(QRS)	TRANSISTOR
	Q319	2SC1740S(QRS)	TRANSISTOR
	Q320	DTC144ES	TRANSISTOR
	Q321	DTC144ES	TRANSISTOR
	Q351	2SC1740S(QRS)	TRANSISTOR, E/EG
	Q352	2SC1740S(QRS)	TRANSISTOR, E/EG
	Q401	2SC1740S(QRS)	TRANSISTOR
	Q402	2SC1740S(QRS)	TRANSISTOR
	Q403	2SC1740S(QRS)	TRANSISTOR
	Q404	2SC1740S(QRS)	TRANSISTOR
	Q405	2SC1740S(QRS)	TRANSISTOR
	Q406	2SC1740S(QRS)	TRANSISTOR
	Q407	2SC1740S(QRS)	TRANSISTOR
	Q411	2SC1740S(QRS)	TRANSISTOR
	Q412	DTC124ES	TRANSISTOR, E/EG
	Q413	DTC124ES	TRANSISTOR
	Q414	2SC1740S(QRS)	TRANSISTOR
	Q415	DTC124ES	TRANSISTOR
	Q416	DTC124ES	TRANSISTOR
	Q417	DTC124ES	TRANSISTOR, E/EG
	Q418	DTC144ES	TRANSISTOR
	Q419	DTC143ES	TRANSISTOR
	Q420	DTC124ES	TRANSISTOR
	Q501	2SA933(S)	TRANSISTOR
	OR	2SA933S(S)	TRANSISTOR
	Q502	2SB643R,S	TRANSISTOR
	Q503	DTC144WS	TRANSISTOR
	Q504	2SB643R,S	TRANSISTOR
	Q505	2SB643R,S	TRANSISTOR
	Q506	DTC124ES	TRANSISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	Q507	DTC124ES	TRANSISTOR
	D101	MA165	DIODE
	OR	1SS133	DIODE
	D102	MA165	DIODE
	OR	1SS133	DIODE
	D103	0A90	DIODE
	D104	0A90	DIODE
	D105	MA165	DIODE
	OR	1SS133	DIODE
	D106	MA165	DIODE
	OR	1SS133	DIODE
	D202	MA165	DIODE
	OR	1SS133	DIODE
	D203	HZS9.1EB1	ZENER DIODE
	D206	MA165	DIODE
	OR	1SS133	DIODE
	D207	MA165	DIODE
	OR	1SS133	DIODE
	D208	MA165	DIODE
	OR	1SS133	DIODE
	D209	MA165	DIODE
	OR	1SS133	DIODE
	D211	MA165	DIODE
	OR	1SS133	DIODE
	D301	MA165	DIODE
	OR	1SS133	DIODE
	D302	MA165	DIODE
	OR	1SS133	DIODE
	D303	MA165	DIODE
	OR	1SS133	DIODE
	D305	MA165	DIODE
	OR	1SS133	DIODE
	D306	MA165	DIODE
	OR	1SS133	DIODE
	D307	MA165	DIODE
	OR	1SS133	DIODE
	D308	MA165	DIODE
	OR	1SS133	DIODE
	D351	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D352	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D353	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D354	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D355	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D356	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D357	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D358	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D403	MA165	DIODE
	OR	1SS133	DIODE
	D405	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D407	MA165	DIODE
	OR	1SS133	DIODE
	D408	MA165	DIODE
	OR	1SS133	DIODE
	D409	MA165	DIODE
	OR	1SS133	DIODE
	D501	MA165	DIODE
	OR	1SS133	DIODE
	D502	MA165	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	OR	1SS133	DIODE
	D503	MA165	DIODE
	OR	1SS133	DIODE
	D504	MA165	DIODE
	OR	1SS133	DIODE
	D505	MA165	DIODE
	OR	1SS133	DIODE
	D507	MA165	DIODE
	OR	1SS133	DIODE
	D615	MA165	DIODE
	OR	1SS133	DIODE
	R101	QRD161J-332	RESISTOR
	R102	QRD161J-152	RESISTOR
	R103	QRD161J-102	RESISTOR
	R104	QRD161J-122	RESISTOR
	R105	QRD161J-821	RESISTOR
	R106	QRD161J-471	RESISTOR
	R107	QRD161J-102	RESISTOR
	R108	QRD161J-152	RESISTOR
	R109	QRD161J-101	RESISTOR
	R110	QVZ3518-222	V RESISTOR, SP PB FREQUENC
	R112	QRD161J-561	RESISTOR
	R113	QRD161J-222	RESISTOR
	R114	QRD161J-222	RESISTOR
	R115	QRD161J-391	RESISTOR
	R116	QRD161J-333	RESISTOR
	R117	QRD161J-333	RESISTOR
	R118	QRD162J-331	RESISTOR
	R119	QVZ3518-681	V RESISTOR, FOR REC FM
	R120	QRD161J-102	RESISTOR
	R121	QRD161J-392	RESISTOR
	R122	QRD161J-103	RESISTOR
	R123	QRD161J-562	RESISTOR
	R124	QRD161J-225	RESISTOR
	R125	QRD161J-475	RESISTOR
	R126	QRD161J-335	RESISTOR
	R127	QRD161J-102	RESISTOR
	R128	QRD161J-152	RESISTOR
	R129	QRD161J-153	RESISTOR
	R130	QRD161J-684	RESISTOR
	R131	QRD161J-824	RESISTOR
	R132	QRD161J-562	RESISTOR
	R133	QRD161J-152	RESISTOR
	R136	QRD161J-102	RESISTOR
	R141	QRD161J-102	RESISTOR
	R142	QRD161J-272	RESISTOR
	R143	QRD161J-181	RESISTOR
	R144	QRD161J-821	RESISTOR
	R145	QRD161J-181	RESISTOR
	R146	QRD121J-391	RESISTOR
	R202	QVZ3518-102	V RESISTOR, LP PB FREQUENCY
	R203	QRD161J-471	RESISTOR
	R204	QRD162J-471	RESISTOR
	R211	QRD161J-562	RESISTOR
	R214	QRD161J-391	RESISTOR
	R215	QRD161J-122	RESISTOR
	R216	QRD161J-681	RESISTOR
	R217	QRD121J-560	CARBON RESISTOR
	R218	QRD161J-103	RESISTOR
	R219	QRD161J-222	RESISTOR
	R220	QRD161J-393	RESISTOR
	R221	QRD161J-473	RESISTOR
	R222	QRD161J-332	RESISTOR
	R223	QVZ3518-682	V RESISTOR, 0.5H DELAY
	R224	QRD161J-102	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R225	QRD161J-122	RESISTOR
	R226	QRD161J-153	RESISTOR
	R227	QRD161J-223	RESISTOR
	R228	QRD161J-561	RESISTOR
	R229	QRD161J-681	RESISTOR
	R230	QRD161J-681	RESISTOR
	R231	QRD161J-681	RESISTOR
	R232	QRD161J-471	RESISTOR
	R233	QRD161J-222	RESISTOR
	R234	QRD161J-102	RESISTOR
	R235	QRD161J-222	RESISTOR
	R236	QRD161J-183	RESISTOR
	R238	QRD161J-822	RESISTOR
	R239	QRD161J-122	RESISTOR
	R240	QRD161J-563	RESISTOR
	R241	QRD161J-822	RESISTOR
	R242	QRD161J-223	RESISTOR
	R243	QRD161J-103	RESISTOR
	R244	QRD161J-103	RESISTOR
	R245	QRD161J-103	RESISTOR
	R246	QRD161J-333	RESISTOR
	R301	QRD161J-102	RESISTOR
	R302	QRD161J-102	RESISTOR
	R303	QRD161J-473	RESISTOR
	R304	QRD161J-272	RESISTOR
	R305	QRD161J-681	RESISTOR
	R306	QRD161J-102	RESISTOR
	R307	QRD161J-102	RESISTOR
	R311	QRD161J-562	RESISTOR
	R312	QRD161J-391	RESISTOR
	R313	QRD161J-561	RESISTOR
	R316	QRD161J-221	RESISTOR
	R317	QRD161J-391	RESISTOR
	R318	QRD161J-122	RESISTOR
	R319	QRD161J-393	RESISTOR
	R320	QRD161J-103	RESISTOR
	R321	QRD161J-103	RESISTOR
	R322	QVZ3518-101	V RESISTOR, FOR SP REC COLOUR
	R323	QRD162J-681	RESISTOR
	R325	QRD161J-102	RESISTOR
	R326	QRD161J-472	RESISTOR
	R327	QRD161J-274	RESISTOR
	R328	QVZ3518-223	V RESISTOR, VXO
	R329	QRD161J-103	RESISTOR
	R330	QRD161J-122	RESISTOR
	R331	QRD161J-222	RESISTOR
	R332	QRD161J-103	RESISTOR
	R333	QRD161J-103	RESISTOR
	R334	QRD161J-102	RESISTOR
	R335	QRD161J-122	RESISTOR
	R336	QRD161J-471	RESISTOR
	R337	QRD161J-152	RESISTOR
	R338	QRD161J-223	RESISTOR
	R339	QRD161J-682	RESISTOR
	R340	QRD161J-102	RESISTOR
	R341	QRD161J-181	RESISTOR
	R342	QRD161J-391	RESISTOR
	R343	QRD161J-331	RESISTOR
	R344	QRD161J-223	RESISTOR
	R345	QRD161J-153	RESISTOR
	R346	QRD161J-222	RESISTOR
	R347	QRD161J-153	RESISTOR
	R348	QRD161J-103	RESISTOR
	R349	QRD162J-271	RESISTOR
	R351	QRD161J-332	RESISTOR, E/EG
	R352	QRD161J-154	RESISTOR, E/EG

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R353	QRD161J-563	RESISTOR, E/EG
	R354	QRD161J-182	RESISTOR, E/EG
	R355	QVZ3518-472	V RESISTOR, SECAM DET, E/EG
	R356	QRD161J-103	RESISTOR, E/EG
	R357	QRD161J-562	RESISTOR, E/EG
	R358	QRD161J-333	RESISTOR, E/EG
	R359	QRD161J-393	RESISTOR, E/EG
	R360	QRD161J-102	RESISTOR, E/EG
	R361	QRD161J-393	RESISTOR, E/EG
	R362	QRD161J-393	RESISTOR, E/EG
	R363	QRD161J-822	RESISTOR, E/EG
	R364	QRD161J-223	RESISTOR, E/EG
	R365	QRD161J-333	RESISTOR, E/EG
	R401	QVZ3518-222	V RESISTOR, DELAY COLOR LEVEL
	R402	QRD161J-222	RESISTOR
	R403	QRD161J-272	RESISTOR
	R404	QRD161J-821	RESISTOR
	R405	QRD161J-222	RESISTOR
	R406	QRD161J-473	RESISTOR
	R407	QRD161J-104	RESISTOR
	R408	QRD161J-391	RESISTOR
	R409	QRD161J-123	RESISTOR
	R410	QRD161J-332	RESISTOR
	R413	QRD161J-223	RESISTOR
	R414	QRD161J-103	RESISTOR
	R415	QRD161J-154	RESISTOR
	R416	QRD161J-221	RESISTOR
	R417	QRD161J-393	RESISTOR
	R418	QVZ3518-473	V RESISTOR, FOR 0.5H JUMP DET
	R419	QRD161J-473	RESISTOR
	R420	QRD161J-122	RESISTOR
	R421	QRD161J-101	RESISTOR
	R423	QRD161J-222	RESISTOR
	R424	QRD161J-561	RESISTOR
	R425	QRD161J-561	RESISTOR
	R426	QRD161J-393	RESISTOR
	R427	QRD161J-223	RESISTOR
	R428	QRD161J-471	RESISTOR
	R429	QRD161J-473	RESISTOR
	R431	QRD161J-682	RESISTOR
	R432	QRD161J-104	RESISTOR
	R433	QRD161J-473	RESISTOR
	R434	QRD161J-472	RESISTOR
	R435	QRD161J-682	RESISTOR, E/EG
	R436	QRD161J-103	RESISTOR
	R437	QRD161J-153	RESISTOR
	R438	QVZ3518-101	V RESISTOR, FOR LP REC COLOUR
	R439	QRD161J-822	RESISTOR, E/EG
	R440	QRD161J-102	RESISTOR
	R441	QRD161J-272	RESISTOR
	R442	QRD162J-683	RESISTOR
	R443	QRD161J-183	RESISTOR
	R444	QRD161J-333	RESISTOR
	R446	QRD161J-562	RESISTOR
	R501	QRD161J-393	RESISTOR
	R502	QRD161J-682	RESISTOR
	R503	QRD161J-393	RESISTOR
	R504	QRD161J-821	RESISTOR
	R505	QRD161J-103	RESISTOR
	R506	QRD161J-393	RESISTOR
	R507	QRD161J-821	RESISTOR
	R508	QRD161J-393	RESISTOR
	R509	QRD161J-821	RESISTOR
	R510	QRD161J-103	RESISTOR
	R511	QRD161J-103	RESISTOR
	R512	QRD161J-332	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C101	QCVB1CN-103	CAPACITOR
	C102	QCSB1HJ-680	CAPACITOR
	C103	QCSB1HJ-390	CAPACITOR
	C104	QET60JM-476	E CAPACITOR
	C105	QCVB1CN-103	CAPACITOR
	C106	QCSB1HJ-470	CAPACITOR
	C107	QCVB1CN-103	CAPACITOR
	C108	QCVB1CN-103	CAPACITOR
	C110	QCVB1CN-103	CAPACITOR
	C112	QCBB1HJ-121	CAPACITOR
	C113	QCVB1CN-103	CAPACITOR
	C114	QCBB1HJ-121	CAPACITOR
	C115	QCBB1HJ-121	CAPACITOR
	C116	QCSB1HJ-270	CAPACITOR
	C117	QET60JM-476	E CAPACITOR
	C118	QCVB1CN-103	CAPACITOR
	C121	QCBB1HJ-151	CAPACITOR
	C122	QCSB1HJ-330	CAPACITOR
	C123	QET61HM-105	E CAPACITOR
	C124	QETB1HM-105	E CAPACITOR
	C125	QCBB1HJ-151	CAPACITOR
	C126	QCBB1HJ-151	CAPACITOR
	C127	QET61HM-225	E CAPACITOR
	C128	QER60JM-107	E CAPACITOR
	C129	QER60JM-107	E CAPACITOR
	C130	QET61EM-335	E CAPACITOR
	C131	QER41HM-105	E CAPACITOR
	C132	QER41HM-225	E CAPACITOR
	C133	QER40JM-476	E CAPACITOR
	C134	QER41HM-225	E CAPACITOR
	C135	QER41EM-475	E CAPACITOR
	C136	QEN41EM-335	NP E CAPACITOR
	C137	QEM51AK-107	E CAPACITOR
	C138	QCVB1CN-103	CAPACITOR
	C139	QCBB1HJ-181	CAPACITOR
	C140	QCBB1HJ-121	CAPACITOR
	C141	QCSB1HJ-560	CAPACITOR
	C142	QCSB1HJ-220	CAPACITOR
	C144	QCBB1HJ-121	CAPACITOR
	C145	QCBB1HJ-151	CAPACITOR
	C146	QET61EM-475	E CAPACITOR
	C147	QET61CM-476	E CAPACITOR
	C148	QCVB1CN-103	CAPACITOR
	C151	QCVC1CN-103	CAPACITOR
	C201	QCSB1HJ-100	CAPACITOR
	C202	QFN31HJ-223	M CAPACITOR
	C211	QCVB1CN-103	CAPACITOR
	C212	QCSB1HJ-100	CAPACITOR
	C213	QCVB1CN-103	CAPACITOR
	C214	QEK60JM-476	E CAPACITOR
	C217	QFN31HJ-102	M CAPACITOR
	C218	QEK61EM-475	E CAPACITOR
	C219	QCBB1HJ-102	CAPACITOR
	C220	QFN31HJ-473	M CAPACITOR
	C221	QEK61AM-107	E CAPACITOR
	C222	QCVB1CN-103	CAPACITOR
	C224	QEK61HM-104	E CAPACITOR
	C225	QEK61EM-475	E CAPACITOR
	C226	QCVB1CN-103	CAPACITOR
	C227	QCVB1CN-103	CAPACITOR
	C229	QEK60JM-476	E CAPACITOR
	C230	QCVB1CN-103	CAPACITOR
	C233	QER41CM-106	E CAPACITOR
	C234	QER41CM-476	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C235	QCVB1CN-103	CAPACITOR
	C236	QCSB1HJ-330	CAPACITOR
	C237	QCSB1HJ-270	CAPACITOR
	C238	QER41AM-476	E CAPACITOR
	C239	QCSB1HJ-200	CAPACITOR
	C241	QCVB1CN-103	CAPACITOR
	C242	QCVB1CN-103	CAPACITOR
	C243	QCBB1HJ-121	CAPACITOR
	C244	QER40JM-107	E CAPACITOR
	C245	QCVB1CN-103	CAPACITOR
	C246	QEK61HM-104	E CAPACITOR
	C247	QEK61HM-105	E CAPACITOR
	C248	QETA1AM-476	E CAPACITOR
	C249	QER41HM-335	E CAPACITOR
	C250	QEK41HM-225	E CAPACITOR
	C251	QCS31HJ-561	CAPACITOR
	C252	QCC11EK-223	CAPACITOR
	C302	QCBB1HJ-820	CAPACITOR
	C303	QCBB1HJ-102	CAPACITOR
	C304	QCVB1CN-103	CAPACITOR
	C305	QFN31HJ-473	M CAPACITOR
	C306	QCSB1HJ-470	CAPACITOR
	C311	QET61CM-106	E CAPACITOR
	C312	QET61HM-474	E CAPACITOR
	C313	QFN31HJ-563	M CAPACITOR
	C314	QET61CM-106	E CAPACITOR
	C315	QET61HM-225	E CAPACITOR
	C316	QET61EM-335	E CAPACITOR
	C317	QFN31HJ-473	M CAPACITOR
	C318	QCVB1CN-103	CAPACITOR
	C319	QET61EM-475	E CAPACITOR
	C320	QEM51AK-107	E CAPACITOR
	C321	QCVB1CN-103	CAPACITOR
	C322	QET61HM-105	E CAPACITOR
	C323	QET61HM-475	E CAPACITOR
	C324	QET61HM-475	E CAPACITOR
	C325	QCVB1CN-103	CAPACITOR
	C326	QCVB1CN-103	CAPACITOR
	C327	QET61HM-105	E CAPACITOR
	C328	QFN31HJ-223	M CAPACITOR
	C329	QCT25CH-220	CAPACITOR
	C330	QCVB1CN-103	CAPACITOR
	C331	QET61CM-106	E CAPACITOR
	C332	QCBB1HJ-101	CAPACITOR
	C333	QCVB1CN-103	CAPACITOR
	C334	QCBB1HJ-102	CAPACITOR
	C335	QET61AM-476	E CAPACITOR
	C336	QCVB1CN-103	CAPACITOR
	C337	QCSB1HK-5R6	CAPACITOR
	C338	QCBB1HJ-681	CAPACITOR
	C339	QCC11EJ-104	CAPACITOR
	C340	QCC11EK-273	CAPACITOR
	OR	QCC11EK-273ZR	CAPACITOR
	C351	QET61CM-476	E CAPACITOR, E/EG
	C352	QCVB1CN-103	CAPACITOR, E/EG
	C353	QET61AM-336	E CAPACITOR, E/EG
	C354	QFN31HJ-182	M CAPACITOR, E/EG
	C355	QFN31HJ-272	M CAPACITOR, E/EG
	C356	QFN31HJ-223	M CAPACITOR, E/EG
	C357	QETB1CM-106	E CAPACITOR, E/EG
	C358	QCVB1CN-103	CAPACITOR, E/EG
	C359	QCBB1HJ-102	CAPACITOR, E/EG
	C401	QCVB1CN-103	CAPACITOR
	C402	QCSB1HJ-220	CAPACITOR
	C403	QCSB1HJ-220	CAPACITOR
	C404	QCVB1CN-103	CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C406	QET61HM-105	E CAPACITOR
	C407	QET61HM-105	E CAPACITOR
	C408	QET61EM-475	E CAPACITOR
	C409	QET61HM-105	E CAPACITOR
	C410	QFN31HJ-152	M CAPACITOR
	C411	QFN31HJ-332	M CAPACITOR
	C412	QCVB1CN-103	CAPACITOR
	C413	QCVB1CN-103	CAPACITOR
	C414	QET60JM-107	E CAPACITOR
	C415	QCVB1CN-103	CAPACITOR
	C416	QFN31HJ-222	M CAPACITOR
	C417	QFN31HJ-103	M CAPACITOR
	C418	QFN31HJ-273	M CAPACITOR
	C419	QFN31HJ-222	M CAPACITOR
	C420	QET61HM-105	E CAPACITOR
	C421	QCVB1CN-103	CAPACITOR
	C422	QCVB1CN-103	CAPACITOR
	C423	QCSB1HJ-680	CAPACITOR
	C424	QCVB1CN-103	CAPACITOR
	C426	QCVB1CN-103	CAPACITOR
	C427	QCVB1CN-103	CAPACITOR
	C431	QET61HM-225	E CAPACITOR
	C432	QFN31HJ-103	M CAPACITOR
	C433	QFN31HJ-104	M CAPACITOR
	C436	QET51AM-226	E CAPACITOR
	L101	PU48530-101K	PEAKING COIL
	L102	PU59152-560J	PEAKING COIL
	L103	PU59152-270J	PEAKING COIL
	L104	PU59152-180J	PEAKING COIL
	L106	PU59152-221J	PEAKING COIL
	L107	PU59152-680J	PEAKING COIL
	L108	PU59152-270J	PEAKING COIL
	L109	PU48530-101K	PEAKING COIL
	L111	PU59152-121J	PEAKING COIL
	L112	PU59152-180J	PEAKING COIL
	L113	PU59152-180J	PEAKING COIL
	L114	PU48530-471J	PEAKING COIL
	L115	PU59152-121J	PEAKING COIL
	L116	PU48530-101K	PEAKING COIL
	L117	PU59152-560J	PEAKING COIL
	L118	PU59152-680J	PEAKING COIL
	L119	PU48530-681J	PEAKING COIL
	L121	PU48530-101K	PEAKING COIL
	L201	PU48530-101K	PEAKING COIL
	L202	PU48530-101K	PEAKING COIL
	L203	PU48530-101K	PEAKING COIL
	L204	PU59152-560J	PEAKING COIL
	L205	PU59152-390J	PEAKING COIL
	L206	PU48530-101K	PEAKING COIL
	L207	PU48530-101K	PEAKING COIL
	L302	PU48530-222J	PEAKING COIL
	L303	PU54223-271J	PEAKING COIL
	L311	PU47051-822	COIL
	L312	PU48530-101K	PEAKING COIL
	L313	PU48530-101K	PEAKING COIL
	L314	PU59152-150J	PEAKING COIL
	L315	PU59152-820J	PEAKING COIL
	L316	PU48530-101K	PEAKING COIL
	L351	PU49057	LC BLOCK, E/EG
	L352	PU53223-101J	PEAKING COIL, E/EG
	L353	PU47051-562	COIL, E/EG
	L401	PU49057	LC BLOCK
	L402	PU57139	LC BLOCK

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	L403	PU59152-330J	PEAKING COIL
	L404	PU48530-101K	PEAKING COIL
	L405	PU59152-100J	PEAKING COIL
	EQ201	PU58315	EQUALIZER
	EQ301	PU53501-7	EQUALIZER
	LPF101	PU58021-2	LOW PASS FILTER
	LPF301	PU58022	LOW PASS FILTER
	LPF302	PU54988	LOW PASS FILTER
	BPF301	PU54410-2	BAND PASS FILTER
	BPF302	PU57072	BAND PASS FILTER
	CF351	PU56983	CERAMIC FILTER, E/EG
	DL101	PU59173	1H DELAY LINE
	DL301	PU58971-3	2H DELAY LINE
	XB301	PU58023	CRYSTAL BLOCK
	X301	PU60307	CRYSTAL RESONATOR
	OR	PU59335	CRYSTAL RESONATOR
	OR	PU31449-4K	CRYSTAL RESONATOR
	TH101	ERT-D2FGL101S	THERMISTOR
	SLD1	PU59170	CCD SHIELD 1
	SLD2	PU59171	CCD SHIELD 2
	SLD3	PU59172	CCD SHIELD 3
	TP	PU57545	TEST PIN, X7
	TP 401	PU56347	TEST POINT
	TP1	PU59391	STYLE PIN
	CN102	PU58844-2	CAP HOUSING
		-MECHACON BOARD ASSEMBLY < 04 >-	
	PWBA	PB10043A2-02	MECHACON BOARD ASSEMBLY
	PWBA2	PB10043A2-02	MECHACON BOARD ASSEMBLY
	IC601	M50965-628SP	IC
	OR	M50965E-312SP	IC
	OR	M50965-641SP	IC
	OR	M50965E-319SP	IC
	IC602	TA8400P	IC
	IC603	M54644BL	IC
	IC604	M54644BL	IC
	Q601	2SC1317R,S	TRANSISTOR
	Q602	2SA1309R,S	TRANSISTOR
	OR	2SA933S(RS)	TRANSISTOR
	Q603	2SC2655O,Y	TRANSISTOR
	OR	2SD1292(QR)	TRANSISTOR
	Q604	2SA1309R,S	TRANSISTOR
	OR	2SA933S(RS)	TRANSISTOR
	Q605	2SC2655O,Y	TRANSISTOR
	OR	2SD1292(QR)	TRANSISTOR
	Q606	2SK656	FE TRANSISTOR(MOS)
	Q607	DTC124EF	TRANSISTOR
	Q608	2SB641R,S	TRANSISTOR
	D602	MA165	DIODE
	OR	1SS133	DIODE
	D603	MA165	DIODE
	OR	1SS133	DIODE
	D604	HZS7.5EB2	ZENER DIODE
	OR	RD7.5ES-T1B2	ZENER DIODE
	OR	MTZ7.5B	ZENER DIODE
	D605	HZS4.7EB2	ZENER DIODE
	D606	S5688G	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	D608	HZS5.6EB1	ZENER DIODE
	OR	MTZ5.6A	ZENER DIODE
	D609	MA27W(A)	DIODE
	D611	HZS6.8EB2	ZENER DIODE
	OR	RD6.8ES-T1B2	ZENER DIODE
	D612	HZS6.8EB2	ZENER DIODE
	OR	RD6.8ES-T1B2	ZENER DIODE
	R601	QRG019J-100A	MF RESISTOR
	R602	QRD161J-332	RESISTOR
	R603	QRD161J-223	RESISTOR
	R604	QRD161J-682	RESISTOR
	R605	QRD161J-223	RESISTOR
	R606	QRD161J-222	RESISTOR
	R608	QRD161J-103	RESISTOR
	R609	QRD161J-103	RESISTOR
	R610	QRD161J-153	RESISTOR
	R611	QRD161J-472	RESISTOR
	R612	QRD161J-103	RESISTOR
	R614	QRD161J-152	RESISTOR
	R615	QRD161J-472	RESISTOR
	R616	QRD161J-472	RESISTOR
	R617	QRD161J-472	RESISTOR
	R618	QRD161J-472	RESISTOR
	R619	QRD161J-472	RESISTOR
	R620	QRD161J-472	RESISTOR
	R621	QRD161J-124	RESISTOR
	R622	QRD161J-472	RESISTOR
	R623	QRD161J-124	RESISTOR
	R624	QRD161J-472	RESISTOR
	R625	QRD161J-472	RESISTOR
	R626	QRD161J-472	RESISTOR
	R627	QRD161J-472	RESISTOR
	R628	QRD161J-333	RESISTOR
	R629	QRD161J-472	RESISTOR
	R630	QRD161J-472	RESISTOR
	R631	QRD162J-333	RESISTOR
	R632	QRD161J-562	RESISTOR
	R633	QRD161J-102	RESISTOR
	R634	QRD161J-102	RESISTOR
	R635	QRD161J-103	RESISTOR
	R636	QRD161J-103	RESISTOR
	R637	QRD161J-102	RESISTOR
	R639	QRD161J-105	RESISTOR
	R642	QRD161J-472	RESISTOR
	R643	QRD161J-272	RESISTOR
	R644	QRD161J-393	RESISTOR
	R645	QRD161J-472	RESISTOR
	R647	QRD161J-332	RESISTOR
	R649	QRD161J-472	RESISTOR
	R653	QRG019J-100A	MF RESISTOR
	RA601	QRB057J-103	RESISTOR ARRAY
	RA602	QRB047J-103	RESISTOR ARRAY
	C601	QFV81HJ-104	M CAPACITOR
	C602	QFV71HJ-104	M CAPACITOR
	C603	QCF31HP-223	CAPACITOR
	C604	QCF31HP-223	CAPACITOR
	C605	QCSB1HJ-330	CAPACITOR
	C606	QCSB1HJ-330	CAPACITOR
	C607	QCBB1HJ-102	CAPACITOR
	C608	QETA1EM-107	E CAPACITOR
	C609	QET61EM-335	E CAPACITOR
	C610	QET61CM-336	E CAPACITOR
	C611	QETC1EM-475	E CAPACITOR
	C614	QEK41EM-106	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C615	QEN41EM-475	NP E CAPACITOR
	C616	QCF11HP-223	CAPACITOR
	C617	QFN31HJ-683	M CAPACITOR
	C622	QET41EM-107	E CAPACITOR
	L601	PU59619	COIL
	CF601	PU55812	RESONATOR
	WR	PU58865-3	FLAT WIRE
	CN601	PU58931-14	CAP HOUSING
	CN602	PU58931-10	CAP HOUSING
	CN603	PU58931-14	CAP HOUSING
	CN604	PU58931-8	CAP HOUSING
	CN605	PU58931-12	CAP HOUSIG
	CN606	PU58931-8	CAP HOUSING
	CN607	PU58798-17	CONNECTOR
	CN608	PU58844-6	CAP HOUSING

-VIDEO SUB BOARD ASSEMBLY-

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA2	PB40007A	V.SUB BOARD ASSEMBLY

The following Parts are included in V. SUB BOARD ASSEMBLY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	IC203	BA7021	IC
	IC601OR	M50965E-319SP	IC
	Q221	DTA144EF	TRANSISTOR
	D221	1SS133	DIODE
	R251	QRD162J-333	RESISTOR
	R252	QRD162J-332	RESISTOR
	C261	QEK51HM-104	E CAPACITOR
	C262	QCSC1HJ-330	CAPACITOR
	JP2	PU59935-10	TERMINAL

****

****

* MOTHER BOARD ASSEMBLY <05> *

****

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU11427M-01	MOTHER BOARD ASSEMBLY
	R1	QRD182J-183	RESISTOR
	CN1	PU58930-14	CAP HOUSING
	CN2	PU58930-14	CAP HOUSING
	CN3	PU58930-10	CAP HOUSING
	CN4	PU58930-14	CAP HOUSING
	CN5	PU58930-8	CAP HOUSING
	CN6	PU58930-12	CAP HOUSING
	CN7	PU58930-8	CAP HOUSING
	CN8	PU58930-14	CAP HOUSING
	CN9	PU58930-20	CAP HOUSING
	CN10	PU58928-15	CAP HOUSING
	CN11	PU59555-7	CAP HOUSING
	CN12	PU58844-9	CAP HOUSING
	CN14	PU58844-7	CAP HOUSING
	CN16	PU59555-7	CAP HOUSING
	CN17	PU59555-5	CAP HOUSING
	CN20	PU58844-4	CAP HOUSING
	CN21	PU58844-2	CAP HOUSING
	CN22	PU58930-22	CAP HOUSING
	CN23	PU58928-10	CAP HOUSING
	CN24	PU58844-12	CAP HOUSING

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION

****

****

* TERMINAL BOARD ASSEMBLY <06> *

****

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PB20006B-01	TERMINAL BOARD ASSEMBLY ,EK
		PB20006A-01	TERMINAL BOARD ASSEMBLY,EG
		PB20006C-01	TERMINAL BOARD ASSEMBLY,E
	IC1	BX6325	IC
	Q1	2SC1740S(QRS)	TRANSISTOR
	Q11	2SC1740S(QRS)	TRANSISTOR
	Q12	2SC1740S(QRS)	TRANSISTOR
	D1	MA165	DIODE
	OR	1SS133	DIODE
	D5	MA165	DIODE
	OR	1SS133	DIODE
	R1	QVZ3518-474	V RESISTOR, V LOCK
	R2	QRD161J-102	RESISTOR
	R3	QRD161J-102	RESISTOR
	R4	QRD161J-102	RESISTOR
	R5	QRD161J-221	RESISTOR
	R6	QRD161J-750	RESISTOR
	R7	QRD161J-750	RESISTOR
	R21	QRD161J-152	RESISTOR
	R22	QRD161J-152	RESISTOR
	R25	QRD161J-152	RESISTOR
	R26	QRD161J-152	RESISTOR
	R31	QRD161J-473	RESISTOR
	R35	QRD161J-473	RESISTOR
	R37	QRD161J-392	RESISTOR
	R40	QRD161J-272	RESISTOR
	R42	QRD161J-123	RESISTOR
	R43	QRD161J-103	RESISTOR
	R44	QRD161J-682	RESISTOR
	C1	QEK61CM-476	E CAPACITOR
	C2	QETC1CM-476	E CAPACITOR
	C3	QEU40JM-477	E CAPACITOR
	C4	QETC1CM-476	E CAPACITOR
	C5	QETC1CM-476	E CAPACITOR
	C6	QEK61CM-476	E CAPACITOR
	C21	QCBB1HJ-102	CAPACITOR
	C22	QCBB1HJ-102	CAPACITOR
	L1	PU48530-101K	PEAKING COIL
	EQ1	PU54838	EQUALIZER, E/EG
	CN1	PU58929-15	CAP HOUSING
	CN3	PU58962-6	CAP HOUSING

****

TUNER/IF BOARD ASSEMBLY <07>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PB20093G	TUNER/IF BOARD ASSEMBLY ,EG
		PB20093B-01	TUNER/IF BOARD ASSEMBLY,EK
		PB20093A-01	TUNER/IF BOARD ASSEMBLY ,E
⚠	RF	PU59241M-2	RF CONV.& MIXER, E/EG
⚠		PU59262S	RF CONV.& MIXER ,EK
⚠	TNR	PU36180	U H F TUNER ,EK
⚠		PU36155-1-4	U/V TUNER ,EG
⚠		PU36155-1-3	U/V TUNER, E
⚠	IC 1	M51365SP	IC
	IC 2	M50440-397SP	IC, E/EG
		M50440-394SP	IC ,EK
	IC 3	M58655P	IC
	Q 1	2SC3354S,T	TRANSISTOR
	Q 2	2SD1468S(RSE)	TRANSISTOR, E/EG
		2SD1468S(RS)	TRANSISTOR, EK
	OR	2SD1450S,T	TRANSISTOR
	Q 3	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 4	2SC1740S(RS)	TRANSISTOR, E/EG
	OR	2SC3311AR,S	TRANSISTOR, E/EG
	Q 5	2SA933S(RS)	TRANSISTOR
	OR	2SA1309R,S	TRANSISTOR
	Q 6	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 7	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 9	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q10	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q11	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q12	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q13	2SK381(C)	FE TRANSISTOR
	Q14	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q15	2SD1468S(RSE)	TRANSISTOR, E/EG
		2SD1468S(RS)	TRANSISTOR, EK
	OR	2SD1450S,T	TRANSISTOR
	Q16	2SD1863(QR)	TRANSISTOR, E/EG
		2SD1292(QR)	TRANSISTOR, EK
	OR	2SC3243D,E	TRANSISTOR
	Q17	2SB1010(QR)	TRANSISTOR, E/EG
		2SB810H,J	TRANSISTOR, EK
	Q18	DTA124ES	TRANSISTOR
	Q21	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q22	2SA933S(RS)	TRANSISTOR
	OR	2SA1309R,S	TRANSISTOR
	Q23	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q25	DTC114ES	TRANSISTOR, E/EG
	Q26	DTC144ES	TRANSISTOR, E/EG
	D 1	1SS133	DIODE
	D 2	1SS133	DIODE
	D 3	1SS133	DIODE
	D 4	1SS133	DIODE
	D 5	1SS133	DIODE
	D 6	HZ30-2	ZENER DIODE
	D 7	MTZ10B	ZENER DIODE
	OR	RD10ES-T1B2	ZENER DIODE
	D 8	1SS133	DIODE
	D 9	MTZ7.5B	ZENER DIODE
	OR	RD7.5ES-T1B2	ZENER DIODE
	D10	E-452-2	DIODE
	D11	RD6.2ES-T1B1	ZENER DIODE, E/EG
	OR	HZS6.2EB1	ZENER DIODE, E/EG
	D12	1SS133	DIODE, E/EG
	D16	1SS133	DIODE, E/EG
	R 1	QRD161J-151	RESISTOR, E/EG
		QRD161J-750	RESISTOR ,EK
	R 2	QRD161J-472	RESISTOR ,EK
		QRD161J-103	RESISTOR, E/EG
	R 3	QRD161J-152	RESISTOR
	R 4	QRD161J-470	RESISTOR
	R 5	QRD161J-331	RESISTOR
	R 6	QRD161J-681	RESISTOR
	R 7	QRD161J-101	RESISTOR
	R 8	QRD161J-470	RESISTOR ,EK
		QRD161J-100	RESISTOR, E/EG
	R 9	QRD161J-332	RESISTOR ,EK
	R10	QRD161J-824	RESISTOR
	R11	QVZ3518-472	V RESISTOR, AGC
	R12	QRD161J-222	RESISTOR
	R13	QRD161J-562	RESISTOR
	R14	QRD161J-332	RESISTOR
	R15	QRD161J-152	RESISTOR, E/EG
	R16	QVZ3518-103	V RESISTOR, VPS Y LEVEL, E/EG
		QRD161J-222	RESISTOR ,EK
	R17	QRD161J-331	RESISTOR
	R18	QRD161J-561	RESISTOR
	R19	QRD161J-470	RESISTOR
	R20	QRD161J-561	RESISTOR
	R23	QRD161J-473	RESISTOR, E/EG
	R25	QRD161J-471	RESISTOR
	R26	QRD161J-681	RESISTOR
	R27	QRD161J-681	RESISTOR
	R28	QRD161J-331	RESISTOR, E/EG
		QRD161J-391	RESISTOR, EK
	R29	QRD161J-332	RESISTOR
	R30	QRD161J-103	RESISTOR
	R31	QRD161J-222	RESISTOR
	R33	QRD161J-472	RESISTOR
	R34	QRD161J-103	RESISTOR
	R40	QRD161J-182	RESISTOR
	R41	QRD161J-272	RESISTOR
	R42	QVZ3518-103	V RESISTOR, COLOR LEVEL
	R43	QRD161J-123	RESISTOR
	R44	QRD161J-123	RESISTOR
	R45	QRD161J-331	RESISTOR
	R46	QRD161J-222	RESISTOR
	R49	QRD161J-331	RESISTOR, E/EG
	R50	QRD161J-680	RESISTOR, E/EG
	R51	QRD161J-222	RESISTOR, E/EG
	R52	QRD161J-471	RESISTOR
	R53	QRD161J-103	RESISTOR
	R54	QRD161J-332	RESISTOR
	R55	QRD161J-680	RESISTOR
	R56	QRD161J-223	RESISTOR
	R57	QRD161J-471	RESISTOR
	R58	QRD161J-102	RESISTOR
	R59	QRD161J-223	RESISTOR
	R60	QRD161J-103	RESISTOR
	R61	QRD161J-334	RESISTOR
	R62	QRD161J-103	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R63	QRD161J-331	RESISTOR
	R75	QRD161J-472	RESISTOR, E/EG
	R76	QRD161J-103	RESISTOR, E/EG
	R77	QRD161J-153	RESISTOR, E/EG
	R78	QRD161J-472	RESISTOR, E/EG
	R79	QRD161J-103	RESISTOR, E/EG
	R80	QRD161J-153	RESISTOR, E/EG
	R81	QRD161J-472	RESISTOR, E/EG
	R82	QRD161J-103	RESISTOR, E/EG
	R83	QRD161J-153	RESISTOR, E/EG
	R84	QRD161J-472	RESISTOR, E/EG
	R85	QRD161J-103	RESISTOR, E/EG
	R86	QRD161J-153	RESISTOR, E/EG
	R87	QRD161J-224	RESISTOR, E/EG
		QRD161J-104	RESISTOR ,EK
	R88	QRD161J-153	RESISTOR
	R91	QRD161J-472	RESISTOR
	R92	QRD161J-562	RESISTOR
	R93	QRD161J-152	RESISTOR
	R94	QRD161J-472	RESISTOR
	R95	QRD161J-121	RESISTOR
	R96	QRD161J-103	RESISTOR
	R97	QRD161J-103	RESISTOR
	R98	QRD161J-153	RESISTOR
	R100	QRD161J-101	RESISTOR
	R101	QRD161J-222	RESISTOR
	R102	QRD161J-222	RESISTOR
	R103	QRD161J-222	RESISTOR
	R104	QRD161J-222	RESISTOR
	R105	QRD161J-222	RESISTOR
	R106	QRD161J-102	RESISTOR
	R107	QRD161J-222	RESISTOR
	R108	QRD161J-103	RESISTOR, E/EG
	R110	QRD161J-104	RESISTOR
	R111	QRD161J-103	RESISTOR ,EK
	R112	QRD161J-222	RESISTOR
	R122	QRD161J-103	RESISTOR
	R123	QRD161J-103	RESISTOR
	R124	QRD161J-103	RESISTOR
	R125	QRD161J-103	RESISTOR
	R126	QRD161J-103	RESISTOR
	R127	QRD161J-473	RESISTOR
	R128	QRD161J-473	RESISTOR
	R130	QRD161J-471	RESISTOR
	R131	QRD161J-102	RESISTOR
	R133	QRD161J-103	RESISTOR
	R134	QRD161J-182	RESISTOR ,EK
		QRD161J-102	RESISTOR, E/EG
	R151	QRD161J-103	RESISTOR, E/EG
	RA 1	QRB047J-104	RESISTOR ARRAY
	C 1	QCSB1HJ-100	CAPACITOR, E/EG
	C 2	QCBB1HK-102	CAPACITOR
	C 3	QCXB1CK-222	CAPACITOR
	C 4	QCBB1HK-102	CAPACITOR
	C 5	QCBB1HK-102	CAPACITOR
	C 7	PU57601-474ME	E CAPACITOR
	C 8	QET61CM-336	E CAPACITOR
	C 9	QCXB1CK-222	CAPACITOR
	C10	QCSB1HJ-220	CAPACITOR ,EK
		QCSB1HJ-470	CAPACITOR, E/EG
	C11	QET61HM-474	E CAPACITOR
	C12	QCT25RH-220	CAPACITOR ,EK

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
		QCT25PH-270	CAPACITOR, E/EG
	C13	QCXB1CK-222	CAPACITOR
	C14	QET61CM-336	E CAPACITOR
	C19	QET61CM-336	E CAPACITOR
	C20	QCXB1CK-222	CAPACITOR
	C21	QCF31HP-223	CAPACITOR
	C22	QCSB1HJ-100	CAPACITOR
	C23	QET61HM-105	E CAPACITOR
	C24	QCC11EK-223	CAPACITOR, E/EG
		QCC31EJ-273	CAPACITOR, EK
	C25	QET61HM-105	E CAPACITOR
	C27	QET61EM-335	E CAPACITOR
	C30	QEN61CM-336	E CAPACITOR, E/EG
		QET61CM-336	E CAPACITOR ,EK
	C31	QCSB1HJ-470	CAPACITOR
	C34	QET61CM-336	E CAPACITOR, E/EG
	C35	QET61CM-106	E CAPACITOR
	C36	QCC11EK-223	CAPACITOR
	C37	QET61HM-474	E CAPACITOR
	C39	QCC31EK-104	CAPACITOR
	C40	QET61CM-106	E CAPACITOR, E/EG
	C41	QET61CM-106	E CAPACITOR, E/EG
	C42	QET61CM-106	E CAPACITOR, E/EG
	C43	QET61CM-106	E CAPACITOR, E/EG
	C44	QET61HM-225	E CAPACITOR
	C46	QFV81HJ-474	M CAPACITOR
	OR	QFZ9011-474	MM CAPACITOR
	C47	QFN31HJ-223	M CAPACITOR
	C48	QCBB1HK-102	CAPACITOR, E/EG
	C49	QCBB1HK-102	CAPACITOR
	C51	QCT25CH-220	CAPACITOR
	C52	QCT25CH-270	CAPACITOR
	C53	QCVB1CM-103	CAPACITOR
	C54	QCVB1CM-103	CAPACITOR
	C55	QET61CM-106	E CAPACITOR
	C56	QET61CM-336	E CAPACITOR
	C57	QET61CM-107	E CAPACITOR
	C58	QCBB1HK-102	CAPACITOR
	C59	QET61AM-336	E CAPACITOR
	C60	QET61AM-107	E CAPACITOR
	C61	QET61CM-106	E CAPACITOR
	C63	QET61HM-106	E CAPACITOR
	C65	QET61CM-336	E CAPACITOR
	C66	PU57601-335MCZ	E CAPACITOR
		PU57601-335MC	E CAPACITOR
	L 2	PU57717-1R2	PEAKING COIL ,EK
		PU57717-1R0J	PEAKING COIL, E/EG
	L 3	PU57717-1R5J	PEAKING COIL, E/EG
		PU57717-1R5	PEAKING COIL ,EK
	L 4	PU59152-6R8K	PEAKING COIL
	L 5	PU59152-150J	PEAKING COIL ,EK
		PU59152-120J	PEAKING COIL, E/EG
	L 6	PU59152-6R8K	PEAKING COIL
	L 7	PU59152-6R8K	PEAKING COIL
	L 8	PU59152-220J	PEAKING COIL
	L10	PU59152-100J	PEAKING COIL
	L11	PU59152-R22K	PEAKING COIL, E/EG
	OR	PU53223-R22K	PEAKING COIL, E/EG
	L12	PU59152-6R8K	PEAKING COIL ,EK
	L13	PU59152-101K	PEAKING COIL ,EK
		PU53223-101J	PEAKING COIL, E/EG
⚠	CF 1	PU57707-2	CERAMIC FILTER, E/EG
		PU57707	CERAMIC FILTER, EK
	CF 2	PU59242-3	CERAMIC FILTER, EK
⚠		PU59242-2	CERAMIC FILTER, E/EG

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	CF 3	PU32990-3	CERAMIC FILTER, EK
⚠		PU32990-2	CERAMIC FILTER, E/EG
	SAW 1	PU35557-4	SAW FILTER, E/EG
		PU32987-4	SAW FILTER ,EK
	X1	PU58554-2	CRYSTAL RESONATOR
	T 1	PU59402	TRAP COIL, FTZ TRAP, E/EG
	T 2	PU59308	COIL, VCO
	T 5	PU55184	IF.TRANSFORMER, SYNC DET
	SLD1	PU36322	SHIELD CASE
	SLD2	PQ31328-1-1	SHIELD COVER, E/EG
	SLD3	PQ42506	SHIELD PLATE, E/EG
	TP	PU59391	STYLE PIN
	CN3	PU58844-3	CAP HOUSING, E/EG
	CN4	PU58928-3	CAP HOUSING, E/EG

****

****

* SERVO BOARD ASSEMBLY <08> *

****

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22283G-05	SERVO BOARD ASSEMBLY
	IC1	M51796P	IC
	OR	BA6405	IC
	IC2	VC2023A-2	IC
	OR	VC2023B-1	IC
	IC3	UPC324C	IC
	OR	IR3702	IC
	Q1	2SD636R,S	TRANSISTOR
	OR	2SC1740S(QRS)	TRANSISTOR
	Q2	2SB641R,S	TRANSISTOR
	OR	2SA933S	TRANSISTOR
	Q3	2SD636R,S	TRANSISTOR
	OR	2SC1740S(QRS)	TRANSISTOR
	Q4	2SB641R,S	TRANSISTOR
	OR	2SA933S	TRANSISTOR
	Q5	DTC144ES	TRANSISTOR
	OR	UN4213	TRANSISTOR
	Q6	DTC144WS	TRANSISTOR
	Q7	DTA144WS	TRANSISTOR
	D1	1SS133	DIODE
	OR	MA165	DIODE
	D2	1SS133	DIODE
	OR	MA165	DIODE
	D3	1SS133	DIODE
	OR	MA165	DIODE
	D7	1SS133	DIODE
	OR	MA165	DIODE
	D8	1SS133	DIODE
	OR	MA165	DIODE
	D10	MTZ12B	ZENER DIODE
	OR	HZS12EB2	DIODE
	D12	1SS133	DIODE
	OR	MA165	DIODE
	D13	MTZ5.1B	ZENER DIODE
	OR	HZS5.1B3	ZENER DIODE
	D15	1SS133	DIODE
	OR	MA165	DIODE
	D16	1SS133	DIODE
	OR	MA165	DIODE
	D19	1SS133	DIODE
	OR	MA165	DIODE
	D20	1SS133	DIODE
	OR	MA165	DIODE
	R1	QRD161J-681	RESISTOR
	R2	QRD161J-102	RESISTOR
	R3	QRD161J-331	RESISTOR
	R4	QRD161J-684	RESISTOR
	R5	QRD161J-102	RESISTOR
	R6	QRD161J-103	RESISTOR
	R7	QRD161J-564	RESISTOR
	R8	QRD161J-103	RESISTOR
	R9	QRD161J-105	RESISTOR
	R10	QRD161J-103	RESISTOR
	R11	QRD161J-681	RESISTOR
	R12	QRD161J-103	RESISTOR
	R13	QRD161J-103	RESISTOR
	R15	QRD161J-101	RESISTOR
	R16	QRD161J-473	RESISTOR
	R17	QRD161J-473	RESISTOR
	R18	QRD161J-473	RESISTOR
	R19	QRD161J-473	RESISTOR
	R20	QRD161J-473	RESISTOR
	R21	QRD161J-473	RESISTOR
	R22	QRD161J-105	RESISTOR
	R23	QRD161J-473	RESISTOR
	R24	QRD161J-473	RESISTOR
	R25	QRD161J-564	RESISTOR
	R26	QRD161J-683	RESISTOR
	R27	QRD161J-105	RESISTOR
	R28	QRD161J-105	RESISTOR
	R29	QRD161J-273	RESISTOR
	R30	QRD161J-102	RESISTOR
	R31	QRD161J-103	RESISTOR
	R32	QRD161J-103	RESISTOR
	R34	QRD161J-333	RESISTOR
	R35	QVZ3521-474	V RESISTOR, LP PB SW POINT
	R36	QRD161J-103	RESISTOR
	R39	QRD161J-393	RESISTOR
	R45	QRD161J-103	RESISTOR
	R46	QVZ3521-474	V RESISTOR,LP TRACKING
	R47	QRD161J-103	RESISTOR
	R55	QRD161J-472	RESISTOR
	R56	QRD161J-103	RESISTOR
	R57	QRD161J-822	RESISTOR
	R58	QRD161J-562	RESISTOR
	R59	QRD161J-104	RESISTOR
	R60	QRD161J-104	RESISTOR
	R61	QRD161J-153	RESISTOR
	R62	QRD161J-102	RESISTOR
	R63	QRD161J-105	RESISTOR
	R64	QRD161J-273	RESISTOR
	R65	QRD161J-101	RESISTOR
	R66	QRD161J-222	RESISTOR
	R67	QRD161J-332	RESISTOR
	R68	QRD161J-105	RESISTOR
	R69	QRD161J-223	RESISTOR
	R70	QRD161J-104	RESISTOR
	R73	QRD161J-103	RESISTOR
	R74	QRD161J-472	RESISTOR
	R75	QRD161J-103	RESISTOR
	R78	QRD161J-185	RESISTOR
	R79	QVZ3521-474	V RESISTOR,FOR SP PB SW POINT
	C1	QCBB1HJ-102	CAPACITOR
	C2	QET61AM-476	E CAPACITOR
	C3	QET61CM-106	E CAPACITOR
	C4	QET61CM-106	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C5	QET61AM-476	E CAPACITOR
	C6	QFV71HJ-104	M CAPACITOR
	C7	QCBB1HJ-102	CAPACITOR
	C8	QET61HM-475	E CAPACITOR
	C9	QCBB1HJ-101	CAPACITOR
	C10	QCBB1HJ-102	CAPACITOR
	C11	QET61CM-106	E CAPACITOR
	C12	QCSB1HJ-330	CAPACITOR
	C13	QCSB1HJ-330	CAPACITOR
	C14	QCVB1CN-103	CAPACITOR
	C15	QFV71HJ-223	M CAPACITOR
	C16	QCXB1CN-472	CAPACITOR
	C17	QCXB1CN-472	CAPACITOR
	C19	QFV71HJ-473	M CAPACITOR
	C20	QFV71HJ-473	M CAPACITOR
	C21	QFV71HJ-473	M CAPACITOR
	C22	QFV71HJ-473	M CAPACITOR
	C23	QCXB1CN-472	CAPACITOR
	C24	QCXB1CN-472	CAPACITOR
	C25	QET61EM-475	E CAPACITOR
	C26	QET61EM-475	E CAPACITOR
	C27	QET61CM-106	E CAPACITOR
	C28	QET61CM-106	E CAPACITOR
	C29	QFN31HJ-682	M CAPACITOR
	C30	QFN31HJ-102	M CAPACITOR
	C31	QFV71HJ-104	M CAPACITOR
	C33	QFV71HJ-154	M CAPACITOR
	C35	QFV71HJ-154	M CAPACITOR
	C36	QCVB1CN-103	CAPACITOR
	C37	QET61CM-106	E CAPACITOR
	C38	QCVB1CN-103	CAPACITOR
	C39	QEN61HM-105	NP E CAPACITOR
	C40	QCBB1HJ-102	CAPACITOR
	C41	QET61HM-225	E CAPACITOR
	C42	QCBB1HJ-102	CAPACITOR
	C43	QEN61HM-105	NP E CAPACITOR
	C44	QET61HM-225	E CAPACITOR
	C45	QCBB1HJ-102	CAPACITOR
	C46	QCBB1HJ-271	CAPACITOR
⚠	X1	PU59335	CRYSTAL RESONATOR
	TP GND	PU55774	TEST PIN
	TP1	PU55774	TEST PIN
	TP11	PU55774	TEST PIN
	TP25	PU55774	TEST PIN
	CN1	PU58844-2	CAP HOUSING
	CN2	PU43351-105	CAP HOUSING
	CN3	PU58844-5	CAP HOUSING
	CN4	PU58931-14	CAP HOUSING
	CN5	PU58931-20	CAP HOUSING

* * *

AUDIO BOARD ASSEMBLY <09>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU36160L	AUDIO BOARD ASSEMBLY ,E/EG
		PU36160M	AUDIO BOARD ASSEMBLY, EK
	IC1	AN3994NK	IC
	Q1	2SD1449S,T	TRANSISTOR
	Q2	2SD1449S,T	TRANSISTOR
	Q3	2SC3311R,S	TRANSISTOR
	Q4	2SB1030R,S	TRANSISTOR
	Q6	DTC124ES	TRANSISTOR
	D2	MA165	DIODE
	OR	1SS133	DIODE
	D3	MA165	DIODE
	OR	1SS133	DIODE
	D4	MA165	DIODE
	OR	1SS133	DIODE
	D5	MA165	DIODE
	OR	1SS133	DIODE
	D12	1SS133	DIODE
	OR	MA165	DIODE
	R1	QRD161J-103	RESISTOR
	R2	QRD161J-224	RESISTOR
	R3	QRD161J-223	RESISTOR
	R4	QRD161J-331	RESISTOR
	R5	QVZ3518-102	V RESISTOR, PB LEVEL
	R6	QRD161J-100	RESISTOR
	R7	QRD161J-471	RESISTOR
	R8	QRD161J-333	RESISTOR
	R9	QRD161J-470	RESISTOR
	R11	QRD161J-563	RESISTOR
	R12	QRD161J-271	RESISTOR
	R13	QRD161J-153	RESISTOR
	R14	QRD161J-153	RESISTOR
	R15	QRD161J-103	RESISTOR
	R16	QRD161J-103	RESISTOR
	R17	QRD161J-103	RESISTOR
	R18	QRD161J-561	RESISTOR
	R19	QRD161J-473	RESISTOR
	R20	QVZ3518-473	V RESISTOR, BIAS LEVEL
	R21	QRD161J-8R2	RESISTOR
	R22	QRD161J-333	RESISTOR
	R23	QRD161J-4R7	RESISTOR
	R24	QRD161J-223	RESISTOR
⚠	R31	PU58802-4R7	POSISTOR
	OR	PU52108-4R7	POSISTOR
	R34	QRD161J-103	RESISTOR
	R35	QRD161J-102	RESISTOR
	C1	QER61EM-475G	E CAPACITOR
	C2	QER61HM-104G	E CAPACITOR
	C3	QFV71HJ-154	M CAPACITOR
	C4	QCC11EJ-123	CAPACITOR
	C5	QEL61HM-105	E CAPACITOR
	C6	QCBB1HJ-102	CAPACITOR
	C7	QCC11EJ-152	CAPACITOR
	C8	QER61CM-226	E CAPACITOR
	C9	QER61EM-335G	E CAPACITOR
	C10	QER61CM-476	E CAPACITOR
	C11	QEK61HM-474G	E CAPACITOR
	OR	QEK61HM-474	E CAPACITOR
	C12	QCBB1HJ-331	CAPACITOR
	C13	QFN31HJ-683	M CAPACITOR
	C14	QFN31HJ-683	M CAPACITOR
	C15	QER61HM-225G	E CAPACITOR
	C16	QCBB1HJ-102	CAPACITOR
	C17	QER60JM-476	E CAPACITOR
	C18	QER61AM-476	E CAPACITOR
	C19	QCBB1HJ-331	CAPACITOR
	C20	QFN31HJ-683	M CAPACITOR
	C21	QER61CM-106G	E CAPACITOR
	C22	QCC11EJ-332	CAPACITOR
	C23	QCC11EJ-223	CAPACITOR
	C24	QCVB1CN-103	CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C26	QER61HM-225G	E CAPACITOR
	L1	PU58308-332J	PEAKING COIL
⚠	T1	PU59307	OSC TRANS
	TP31	PU55774	TEST PIN
	TP32	PU55774	TEST PIN
	CN1	PU58844-7	CAP HOUSING
	CN2	PU58844-4	CAP HOUSING
	CN3	PU58844-7	CAP HOUSING

* * *

AUDIO/CTL HEAD BOARD <12>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU58016	A/C HEAD BOARD
	BKT1	PQ43014	BRACKET
	SCW1	SPSH1740	MINI SCREW
	CN1	PU54537-5	CAP HOUSING
	CN2	PU54537-2B	CAP HOUSING

* * *

TIMER BOARD ASSEMBLY <15>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PB20002B-01	TIMER BOARD ASSEMBLY,EK
		PB20002A-01	TIMER BOARD ASSEMBLY ,E/EG
	IC2	S-8053ALB	IC
	OR	S-8053HLB	IC
	IC101	UPD75216ACW-041	IC
	IC102	UPD82C43CY	IC
	Q1	2SC1317R,S	TRANSISTOR
	Q2	2SC3311A(RS)	TRANSISTOR
	Q3	2SC3311A(RS)	TRANSISTOR
	Q101	DTC124ES	TRANSISTOR
	Q102	DTC124ES	TRANSISTOR
	D1	MTZJ5.1B	ZENER DIODE
	OR	RD5.1ES-T1B2	ZENER DIODE
	D2	1SS133	DIODE
	D3	1SS133	DIODE
	D5	RD9.1ES-T1B2	ZENER DIODE
	D6	DA210S	DIODE
⚠	D7	RD8.2EB1	ZENER DIODE
⚠	OR	RD8.2EB2	ZENER DIODE
⚠	D8	RD8.2EB1	ZENER DIODE
⚠	OR	RD8.2EB2	ZENER DIODE
	D103	1SS133	DIODE
	OR	MA165	DIODE
	D106	1SS133	DIODE,E/EG
	OR	MA165	DIODE,E/EG
	D107	1SS133	DIODE
	OR	MA165	DIODE
	D108	1SS133	DIODE
	OR	MA165	DIODE
	R1	QRD161J-222	RESISTOR
	R2	QRD161J-121	RESISTOR
	R3	QRD161J-682	RESISTOR
	R4	QRD161J-103	RESISTOR
	R5	QRD161J-104	RESISTOR
	R6	QRD161J-471	RESISTOR
	R7	QRD161J-151	RESISTOR
	R8	QRD161J-102	RESISTOR
	R9	QRD161J-472	RESISTOR
	R10	QRD161J-474	RESISTOR
	R11	QRD161J-104	RESISTOR
	R12	QRD161J-684	RESISTOR
	R101	QRD161J-102	RESISTOR
	R102	QRD161J-102	RESISTOR
	R103	QRD161J-102	RESISTOR
	R104	QRD161J-472	RESISTOR
	R105	QRD161J-102	RESISTOR
	R106	QRD161J-103	RESISTOR
	R107	QRD161J-103	RESISTOR
	R108	QRD161J-103	RESISTOR
	R109	QRD161J-102	RESISTOR
	R110	QRD161J-102	RESISTOR
	R111	QRD161J-102	RESISTOR
	R113	QRD161J-472	RESISTOR
	R114	QRD161J-472	RESISTOR
	R115	QRD161J-472	RESISTOR
	R116	QRD161J-472	RESISTOR
	R117	QRD161J-472	RESISTOR
	R118	QRD161J-102	RESISTOR
	R119	QRD161J-472	RESISTOR
	R120	QRD161J-472	RESISTOR
	R121	QRD161J-472	RESISTOR
	R122	QRD161J-472	RESISTOR
	R125	QRD161J-102	RESISTOR
	R131	QRD161J-472	RESISTOR
	R132	QRD161J-472	RESISTOR
	R133	QRD161J-472	RESISTOR
	R134	QRD161J-472	RESISTOR
	R135	QRD161J-472	RESISTOR
	R136	QRD161J-472	RESISTOR
	R137	QRD161J-472	RESISTOR
	R138	QRD161J-472	RESISTOR
	R139	QRD161J-102	RESISTOR
	R140	QRD161J-472	RESISTOR
	R141	QRD161J-472	RESISTOR
	R142	QRD161J-472	RESISTOR
	R143	QRD161J-472	RESISTOR
	R144	QRD161J-472	RESISTOR
	R145	QRD161J-472	RESISTOR, E/EG
	R146	QRD161J-472	RESISTOR, E/EG
	R147	QRD161J-472	RESISTOR, E/EG
	R148	QRD161J-472	RESISTOR, E/EG
	R149	QRD161J-102	RESISTOR
	R150	QRD161J-102	RESISTOR
	R154	QRD161J-472	RESISTOR
	R158	QRD161J-333	RESISTOR
	R160	QRD161J-472	RESISTOR
	R165	QRD161J-103	RESISTOR
	R166	QRD162J-104	RESISTOR
	R168	QRD161J-683	RESISTOR
	R169	QRD161J-102	RESISTOR
	RA101	QRB047J-472	RESISTOR NETWORK
	OR	RNBH5A472	RESISTOR NETWORK
	OR	QRB049J-472	RESISTOR ARRAY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	RA103	QRB047J-333	RESISTOR ARRAY
	OR	RNBH5A333	RESISTOR NETWORK
	OR	QRB049J-333	RARRAY
	RA104	QRB087J-224	RESISTOR NETWORK
	OR	QRB089J-224	RESISTOR NETWORK
	OR	RNBH9A224	RESISTOR NETWORK
	RA105	QRB067J-104	RESISTOR ARRAY
	OR	RNBH7A104	RESISTOR NETWORK
	OR	QRB069J-104	RESISTOR NETWORK
	RA106	QRB047J-224	RESISTOR NETWORK
	OR	RNBH5A224	RESISTOR NETWORK
	OR	QRB049J-224	RESISTOR NETWORK
	C1	QETC1CM-336	E CAPACITOR
	C2	QETC1HM-335	E CAPACITOR
	C3	QETC1AM-336	E CAPACITOR
	C4	QETC0JM-336	E CAPACITOR
	C5	QCBB1HJ-102	CAPACITOR
	C6	QCVB1CM-103	CAPACITOR
	C7	QETC1CM-106	E CAPACITOR
	C8	QETA0JM-338	E CAPACITOR
	C9	QCVB1CM-103	CAPACITOR
	C101	PU57672-200	TRIMMER CAPACITOR, TIMER CLOCK
	C102	QCT30CH-120	CAPACITOR
	C105	QCC11EK-104	CAPACITOR
	C107	QCVB1CM-103	CAPACITOR
	L 1	PU48530-101K	PEAKING COIL
⚠	X102	PU60226	CRYSTAL RESONATOR
	TP1	PU56008	TEST-PIN
	TP2	PU56008	TEST-PIN
	TP3	PU56008	TEST-PIN
	CN1	PU58931-22	CAP HOUSING
	CN2	PU58929-10	CAP HOUSING
	CN3	PU58844-106	CAP HOUSING
	CN4	PU58844-104	CAP HOUSING, E/EG

****

****

*   VPS BOARD ASSEMBLY (EG ONLY) <18>   *

****

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU36127C	VPS BOARD ASSEMBLY
	IC1	HD49703NT	IC
	IC2	M5278L05	IC
	Q1	2SB641R,S	TRANSISTOR
	Q2	2SC3327A	TRANSISTOR
	OR	2SC2878A	TRANSISTOR
	Q3	2SD637R,S	TRANSISTOR
	D1-D5	1SS133	DIODE,X5
	R1	QRD161J-103	RESISTOR
	R2	QRD161J-103	RESISTOR
	R3	QRD161J-102	RESISTOR
	R4	QRD161J-102	RESISTOR
	R5	QRD161J-102	RESISTOR
	R6	QRD161J-473	RESISTOR
	R7	QRD161J-103	RESISTOR
	R8	QRD161J-391	RESISTOR
	R9	QRD161J-562	RESISTOR
	R10	QRD161J-102	RESISTOR
	R11	QRD161J-473	RESISTOR
	R12	QRD161J-562	RESISTOR
	R13	QRD161J-105	RESISTOR
	R14	QRD161J-472	RESISTOR
	R15	QRD161J-472	RESISTOR
	R16	QRD161J-472	RESISTOR
	R17	QRD161J-472	RESISTOR
	R18	QRD161J-562	RESISTOR
	R19	QRD161J-563	RESISTOR
	R20	QRD161J-222	RESISTOR
	R21	QRD161J-222	RESISTOR
	R22	QRD161J-222	RESISTOR
	R23	QRD161J-222	RESISTOR
	R24	QRD161J-472	RESISTOR
	R25	QRD161J-682	RESISTOR
	R26	QRD161J-472	RESISTOR
	R27	QRD161J-102	RESISTOR
	R28	QRD161J-103	RESISTOR
	R29	QRD161J-103	RESISTOR
	R30	QRD161J-184	RESISTOR
	R31	QRD161J-103	RESISTOR
	R32	QRD161J-332	RESISTOR
	R33	QRD161J-561	RESISTOR
	R34	QRD161J-474	RESISTOR
	R35	QRD161J-474	RESISTOR
	R36	QRD161J-332	RESISTOR
	R37	QRD161J-103	RESISTOR
	RA1	RNBH5A224	RESISTOR ARRAY
	C1	QETC1CM-336	E CAPACITOR
	C2	QCS31HJ-681	CAPACITOR
	C3	QETC1CM-106	E CAPACITOR
	C4	QCS31HJ-391	CAPACITOR
	C5	QCT25CH-390	CAPACITOR
	C6	QFN31HJ-103	M CAPACITOR
	C7	QFN31HJ-102	M CAPACITOR
	C8	QFN31HJ-102	M CAPACITOR
	C9	QETC1CM-336	E CAPACITOR
	C10	QETC1CM-336	E CAPACITOR
	C11	QCF31HP-473	CAPACITOR
	C12	QETC1CM-336	E CAPACITOR
	C13	QETC1CM-336	E CAPACITOR
	C14	QETC1CM-336	E CAPACITOR
	C15	QCS31HJ-391	CAPACITOR
	C16	QETC1HM-335	E CAPACITOR
	C17	QETC1HM-105	E CAPACITOR
	C18	QETC1HM-106	E CAPACITOR
	C19	QCT25CH-390	CAPACITOR
	C20	QCT25CH-150	CERAMIC CAP
	C21	QETC1CM-336	E CAPACITOR
	C22	QCT25CH-100	CAPACITOR
	T1	PU58484	COIL
	TP1-TP6	PU56008	TEST-PIN,X6
	CN1	PU58929-3	CAP HOUSING
	CN2	PU58844-4	CAP HOUSING

****

****

*   OPERETION BOARD ASSEMBLY <22>   *

****

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU11406H-01	OPERATION BORRD ASSEMBLY
	D201	SLR-34VC3F	LE DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R200	QRD161J-331	RESISTOR
	R201	QRD161J-103	RESISTOR
	R203	QRD161J-223	RESISTOR
	R205	QRD161J-220	RESISTOR
	R207	QRD161J-152	RESISTOR
	R208	QRD161J-222	RESISTOR
	R209	QRD161J-222	RESISTOR
	R215	QRD161J-222	RESISTOR
	R216	QRD161J-222	RESISTOR
	R217	QRD161J-332	RESISTOR
	R218	QRD161J-472	RESISTOR
	R219	QRD161J-103	RESISTOR
	R401	PU57925-3	V RESISTOR,TRACKING
	R402	PU59166	V RESISTOR,SHARPNESS
	C202	QFN41HJ-273	M CAPACITOR
	C203	QEK61CM-226	E CAPACITOR
	C204	QEK61HM-105	E CAPACITOR
	C206	QEK61AM-476	E CAPACITOR
	S201	PU57550	SWITCH(TACT)
	S202	PU57550	SWITCH(TACT)
	S204	PU57551	SWITCH(TACT)
	S205	PU57551	SWITCH(TACT)
	S206	PU57551	SWITCH(TACT)
	S207	PU57551	SWITCH(TACT)
	S208	PU57551	SWITCH(TACT)
	S209	PU57551	SWITCH(TACT)
	HD1	PQM30038	LED HOLDER
	SLD1	PQ30658	SHIELD CASE
	SLD2	PQ30645-1-2	SHIELD PLATE
	CN1	PU59555-105	CAP HOUSING
	CN2	PU59555-107	CAP HOUSING

-IFR BOARD ASSEMBLY-

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU58006B	IFR BOARD ASSEMBLY

The following are included in IFB BOARD ASSEMBLY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	IC1	LA7224	IC
	D4	PD49PI	PIN PHOTO DIODE
	R7	QRD161J-104	RESISTOR
	R9	QRD161J-102	RESISTOR
	C5	QEK60JM-476	E CAPACITOR
	L1	PU59060	TRAP COIL

* * *

DISPLAY/SWITCH BOARD ASSEMBLY <28>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22339G	DIS/SW BOARD ASSEMBLY ,E/EK
		PU22339F	DIS/SW PWB ASSY ,EG
	IC1	UPD7538ACU-214	IC
	D1	RD7.5EB2	ZENER DIODE
	D402	1SS132	DIODE
	R1	QRD161J-103	RESISTOR
	R2	QRD161J-102	RESISTOR
	R3	QRD161J-102	RESISTOR
	R4	QRD161J-102	RESISTOR
	R5	QRD161J-103	RESISTOR
	R6	QRD161J-472	RESISTOR
	R7	QRD161J-273	RESISTOR
	R8	QRD161J-104	RESISTOR
	C1	QCBB1HJ-101	CAPACITOR
	C2	QCBB1HJ-101	CAPACITOR
	C3	QER61HM-106	E CAPACITOR
	C4	QCVB1CN-103	CAPACITOR
	C5	QER61HM-106	E CAPACITOR
	C6	QCF11HP-103	CAPACITOR
	C7	QCBB1HJ-102	CAPACITOR
⚠	CF1	PU59109	RESONATOR
	S1	PU53598	SWITCH(TACT)
	S2	PU53598	SWITCH(TACT)
	S3	PU53598	SWITCH(TACT)
	S4	PU53598	SWITCH(TACT)
	S5	PU53598	SWITCH(TACT)
	S6	PU53598	SWITCH(TACT)
	S7	PU53598	SWITCH(TACT)
	S8	PU53598	SWITCH(TACT)
	S9	PU53598	SWITCH(TACT)
	S10	PU53598	SWITCH(TACT)
	S11	PU53598	SWITCH(TACT)
	S13	PU53598-2	SWITCH(TACT)
	S14	PU53598-2	SWITCH(TACT)
	S15	PU53598	SWITCH(TACT)
	S16	PU53598-2	SWITCH(TACT)
	S17	PU53598	SWITCH(TACT)
	S18	PU53598	SWITCH(TACT)
	S19	PU53598-2	SWITCH(TACT)
	S20	PU53598-2	SWITCH(TACT)
	S21	PU53598-2	SWITCH(TACT)
	S22	PU53598-2	SWITCH(TACT)
	S23	PU53598-2	SWITCH(TACT)
	S24	PU53598-2	SWITCH(TACT)
	S25	PU53598-2	SWITCH(TACT)
	S26	PU53598-2	SWITCH(TACT)
	S27	PU53598-2	SWITCH(TACT)
	S29	PU53598-2	SWITCH(TACT)
	S30	PU53598-2	SWITCH(TACT)
	S402	PU52621	PUSH SWITCH
	FDP	PU59959-2	FLUORESCENT DISPLAY PANEL,EG
		PU59959	FLUORESCENT DISPLAY PANEL,E/EK
	HD1	PQ31355	FDP HOLDER(L)
	HD2	PQ31356	FDP HOLDER(R)

* * *

UPPER DRUM BOARD <41>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWB	PDM3018	UPPER DRUM BOARD

* * *

PRE/REC BOARD ASSEMBLY <43>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU36147B-02	PRE/REC BOARD ASSEMBLY
	IC1	HA11870NT	IC
	Q1	DTC144WS	TRANSISTOR
	Q2	DTC144WS	TRANSISTOR
	Q3	2SA1309R,S	TRANSISTOR
	Q4	DTC144WS	TRANSISTOR
	Q5	DTC144WS	TRANSISTOR
	Q6	2SC1740S(QRS)	TRANSISTOR
	D1	MA165	DIODE
		OR 1SS133	DIODE
	D2	MA165	DIODE
		OR 1SS133	DIODE
	D3	MA165	DIODE
		OR 1SS133	DIODE
	D4	MA165	DIODE
		OR 1SS133	DIODE
	D5	MA165	DIODE
		OR 1SS133	DIODE
	R1	QVZ3518-221	V RESISTOR, SP CH-2,Q
	R2	PU57457-221	V RESISTOR, SP CH-1,Q
	R3	QVZ3518-221	V RESISTOR, LP CH-1,Q
	R4	PU57457-221	V RESISTOR, LP CH-2,Q
	R5	QRD161J-184	RESISTOR
	R8	QRD161J-393	RESISTOR
	R9	QRD161J-103	RESISTOR
	R10	QRD161J-153	RESISTOR
	R11	QRD161J-103	RESISTOR
	R12	QRD161J-103	RESISTOR
	R13	QRD161J-103	RESISTOR
	R14	QRD161J-223	RESISTOR
	R15	QRD161J-103	RESISTOR
	R17	QRD161J-152	RESISTOR
	R18	QRD161J-332	RESISTOR
	R19	QRD161J-561	RESISTOR
	R20	QRD161J-561	RESISTOR
	R21	QRD161J-561	RESISTOR
	R22	QRD161J-474	RESISTOR
	R23	QRD161J-223	RESISTOR
	R24	QRD161J-223	RESISTOR
	C1	QCVB1CN-103	CAPACITOR
	C2	QFZ0096-224	MM CAPACITOR
	C3	QFZ0096-224	MM CAPACITOR
	C4	QCSB1HJ-220	CAPACITOR
	C5	PU57672-500	TANTAL CAPACITOR
	C6	QCSB1HJ-390	CAPACITOR
	C7	PU57672-500	TANTAL CAPACITOR
	C8	QCVB1CN-103	CAPACITOR
	C9	QCVB1CN-103	CAPACITOR
	C10	QFZ0096-224	MM CAPACITOR
	C11	QFZ0096-224	MM CAPACITOR
	C12	QCSB1HJ-330	CAPACITOR
	C13	PU57672-500	TANTAL CAPACITOR
	C14	QCSB1HJ-390	CAPACITOR
	C15	PU57672-500	TANTAL CAPACITOR
	C16	QCVB1CN-103	CAPACITOR
	C17	QER60JM-476	E CAPACITOR
	C18	QCF31HP-223	CAPACITOR
	C20	QCBB1HJ-681	CAPACITOR
	C21	QCVB1CN-103	CAPACITOR
	C22	QCVB1CN-103	CAPACITOR
	C23	QEK61HM-104	E CAPACITOR
	C24	QCVB1CN-103	CAPACITOR
	C25	QCBB1HJ-820	CAPACITOR
	C26	QCF31HP-223	CAPACITOR
	C27	QER60JM-476	E CAPACITOR
	C29	QCVB1CN-103	CAPACITOR
	C31	QCSB1HJ-300	CAPACITOR
	C32	QCVB1CN-103	CAPACITOR
	C33	QCF31HP-223	CAPACITOR
	C34	QET60JM-476	E CAPACITOR
	L1	PU54223-101K	PEAKING COIL
	L4	PU54223-560J	PEAKING COIL
	L5	PU54223-101K	PEAKING COIL
	L6	PU54223-101K	PEAKING COIL
	BKT	PQ42558	PWB BKT,FOR PRE/REC BOARD
	ETH	PQ40433-2	EARTH LUG
	SPC	WAS2600Z	WASHER
	SCW1	DPSP2606Z	SCREW
	SCW2	DPSP2606Z	SCREW
	SLD1	PU59080	PRE SHIELD
	SLD2	PU59081-1-3	PRE SHIELD COVER
	TP	PU57545	TEST PIN, X5
	CN1	PU58844-12	CAP HOUSING
	CN2	PU56258-10	CAP HOUSING
	CN3	PU58844-2	CAP HOUSING

* * *

DECK TERMINAL BOARD ASSEMBLY <51>

REF NO.	PART NO.	PART NAME, DESCRIPTION
PWBA	PU22329B1	DECK TERMINAL BOARD ASSY
R1	QRD181J-151	RESISTOR
R3	QRD181J-331	RESISTOR
PHS1	GP3A21	P.INTERRUPTER
CN1	PU58798-17	CAP CONNECTOR

* * *

RELAY BOARD ASSEMBLY <52>

REF NO.	PART NO.	PART NAME, DESCRIPTION
PWBA	PU22329D2	RELAY BOARD ASSY
LC	PU59809-222T	E FILTER

* * *

REC SAFETY BOARD ASSEMBLY <53>

REF NO.	PART NO.	PART NAME, DESCRIPTION
PWBA	PU22329A3	REC SAFETY BOARD ASSY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	S1	PU58644-1-3	REC SAFETY SWITCH

END SENSOR BOARD ASSEMBLY <54>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PU22329A4	END SENSOR BOARD ASSY
	Q1	PN268R-NC	PHOTO TRANSISTOR
	HD	PQ31047	END SENSOR HOLDER
	CN1	PU49215-102	CAP HOUSING

CASSETTE HOUSING BOARD <56>

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWB1	PU36044-1-2	CASSETTE HOUSING BOARD
	Q1	PN268R-NC	PHOTO TRANSISTOR
	R1	QRD161J-471	RESISTOR
	PHS1	PU58879	PHOTO INTERRUPTER
	CN1	PU58844-106	CAP HOUSING

REMOTE CONTROL BOARD ASSEMBLY [RM]

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	PWBA	PQ10543-001	REMOCON BOARD ASSY, E/EG
		PQ10543-002	REMOCON BOARD ASSY, EK
	IC1	M50565-016	IC
	Q1	2SD601(RS)	TRANSISTOR
	Q2	2SB822(RS)	TRANSISTOR
	D1	SE303AY	LE DIODE
	D2	SE303AY	LE DIODE
	D1	MA151WA	DIODE
	D2	MA151A	DIODE, EK
	D3	MA151WK	DIODE
	D4	MA151WK	DIODE
	D5	MA151WK	DIODE
	D6	MA151WK	DIODE
	D7	MA151WK	DIODE
	D8	MA151WK	DIODE
	D9	MA152WK	DIODE
	D10	MA151WK	DIODE
	D19	MA151WA	DIODE
	D20	MA151A	DIODE
	X1	CSB400PB1T	CERAMIC RESONATOR
	S129	PQ10355-021	SLIDE SWITCH
	TML1	PQ10355-018	BATTERY TERMINAL, (−)
	TML2	PQ10355-017	BATTERY TERMINAL, (+)

JVC

SERVICE MANUAL

VIDEO-KASSETTEN-REKORDER VHS PAL

HR-D230EG EINSTELLANWEISUNG

TECHNISCHE DATEN

Format : VHS PAL-Standard
Video-Aufnahmesystem: Rotierendes Zweikopfsystem, Schrägspurabtastung mit im Winkel versetzten Köpfen, 2 Videokopfpaare, 1 Paar für SP-Betrieb, 1 Paar für LP-Betrieb
Video-Signalsystem : PAL-Farl- und CCIR-Monochrom-signale, 625 Linien
Bandbreite : 12,65 mm
Maximale Spielzeit (SP) : 240 Min. mit E-240-Kassette
(LP): 480 Min mit E-240-Kassette
Temperaturbedingungen
Betrieb : 5°C bis 40°C
Lagerung : -20°C bis 60°C
Empfangskanäle : VHF 47 – 89 MHz
104 – 300 MHz
302 – 470 MHz
UHF 470 – 862 MHz
Antennenausgang : UHF-Kanäle 32 – 40 (einstellbar)
Leistungsaufnahme : 31 Watt
Spannungsversorgugn : 220 V∿, 50/60 Hz

Video
Eingang : 0,5 bis 2,0 Vss, 75 Ohm, unsymmetrisch
Ausgang : 1,0 Vss, 75 Ohm, unsymmetrisch
Störspannungsabstand : 43 dB (Rohde & Schwarz Geräuschmesser) bei Bildschärferegler in Mittenposition
Horizontale Auflösung : 250 Linien bei Bildschärferegler in Mittenposition

Audio
Eingang : AUDIO-Buchse (5pol. DIN): -8 dBs, mehr als 50 kOhm, unsymmetrisch
: AUDIO/VIDEO-Buchse (21pol. Peri-Buchse): -3,8 dBs CENELEC-Norm), über 10 kOhm, unsymmetrisch
Ausgangspegel : AUDIO-Buchse (5 pol. DIN): -6 dBs, hochohmig
AUDIO/VIDEO-Buchse (21pol. Peri-Buchse): -3,8 dBs (CENELEC-Norm), hochohmig
Ausgangsimpedanz : Unter 1 kOhm, unsymmetrisch
Störspannungsabstand: Über 40 dB
Frequenzbereich : 70 Hz bis 10.000 Hz
Schaltuhr : 1 Jahr/8 Programme
Abmessungen : 435(B) x 95(H) x 341(T) mm
Gewicht : 7,2 kg
Mitgeliefertes Zubehör : Antennenkabel, Infrarot-Fernbedienung Batterie "R6" x2

Technische Änderungen vorbehalten.
Die technischen Angaben beziehen sich, sofern nicht anders angegeben, auf die SP-Betriebsart.

COPYRIGHT © 1987 VICTOR COMPANY OF JAPAN, LTD.

No. 82011VD
September 1987

INHALT

1. MECHANISCHE EINSTELLUNG 1-1

1.1 ALLEGEMEINE BESCHREIBUNG 1-1
1.1.1 Vorsichtsmaßregeln 1-1
1.1.2 Erforderliche Prüfgeräte, Halterungen und Einstellehren 1-1
1.1.3 Demontage (Gehäuse) 1-1
1.1.4 Anordnung der Haupt-Teile 1-3

1.2 AUSTAUSCH DER HAUPTBAUGRUPPEN 1-4
1.2.1 Obere Trommel 1-4
1.2.2 Audio/Kontrollkopf (A/C) 1-4
1.2.3 Bremsband-Baugruppe 1-5

1.3 MONTAGE DES MECHANISMUS 1-5
1.3.1 Ladearm-Baugruppe 1-5
1.3.2 Steuernocke 1-5
1.3.3 Nockenklammer-Baugruppe 1-6
1.3.4 Betriebsartenschalter 1-6

1.4 ANORDNUNG UND EINSTELLUNG 1-6
1.4.1 Bandzugfühlhebelposition-Einstellung 1-6
1.4.2 Aufwickeldrehkraftprüfung 1-6

1.5 PRÜFUNGEN UND JUSTIERUNGEN DES BANDTRANSPORTSYSTEMS 1-7
1.5.1 Justierugen des Bandtransportsystems 1-7

1.6 PRÜFUNGEN UND JUSTIERUNGEN ZUR AUSTAUSCHBERKEIT 1-8
1.6.1 Prüfung und Justierung der FM-Hüllkurve 1-8
1.6.2 Einstellung von Höhe und Azimut des Audio/Kontrollkopfs 1-8
1.6.3 Kontrollkopf-Phaseneinstellung 1-9
1.6.4 Festziehen der Stellschraube 1-9
1.6.5 Schlußprüfungen 1-9

2. ELEKTRISCHE EINSTELLUNGEN 2-1

2.1 VORBEREITUNG 2-1
2.1.1 Erforderliche Prüfgeräte 2-1
2.1.2 Prüfungs-und Justierungsschritte 2-2

2.2 SERVO-SCHALTUNG 2-3
2.3 PRE/REC-SCHALTUNG 2-3
2.4 VIDEO-SCHALTUNG 2-4
2.5 AUDIO-SCHALTUNG 2-6
2.6 TIMER-SCHALTUNG 2-6
2.7 TUNER/IF-SCHALTUNG 2-6

ABSCHNITT 1
MECHANISCHE EINSTELLUNG

1.1 ALLGEMEINE BESCHREIBUNG

1.1.1 Vorsichtsmaßregeln

WICHTIG:

1. Das Gerät vor dem Ausbau oder Löten von Bauteilen vom Stromnetz abtrennen.
2. Beim Abnehmen von Befestigungsteilen (Schrauben, Unterlegscheiben usw.) darauf achten, diese nicht in den Mechanismus fallen zu lassen. Falls eine Unterlegscheibe in den Mechismus fällt, diese immer entfernen.
3. Der Bandtransportmechanismus wurde im Werk präzise eingestellt und braucht normalerweise nicht nachgestellt zu werden.
4. Beim Ausbauen von Teilen darauf achten, nicht andere Teile zu beschädigen oder auszubauen. (Besonders vorsichtig mit den Bandführungen und der Drehkopf-Videotrommel umgehen.)
5. Für Wartungsarbeiten, die erfordern, daß der Cassettenschacht vom Haupt-Deck getrennt wird, die unten aufgeführten Schritte befolgen.

1) Eine Platte isoliertes Material rechts neben das Chassis legen.
2) Den Cassettenschacht vom Haupt-Deck ausbauen und auf das isolierte Material legen, ohne dabei die Steckverbindung von der VIDEO Platine abzutrennen.
3) Eine Cassette in den Cassettenschacht legen. Der Schachtmechanismus zieht die Cassette ein.
4) Den Fototransistor-Sensor (END SENSOR) auf dem Haupt-Deck mit einer undurchsichtigen Abdeckung abdecken.
5) Die gewünschten Betriebsarten können mit den Bedienungstasten eingestellt werden.

1.1.2 Erforderliche Prüfgeräte, Halterungen und Einstellehren

Für richtige mechanische Einstellung werden die folgenden Werkzeuge und Haltevorrichtungen dringend empfohlen. Ohne diese wäre eine lange Testbetriebszeit erforderlich, und das Gerät könnte möglicherweise beschädigt werden. Außerdem werden Normalwerkzeuge gebraucht.

1. Erforderliche Prüfgeräte
   Farbfernseher oder Monitor
   Oszilloskop: Breitband, Zweikanal, getriggert, verzögerte Zeitbasis
   Aufnahmeband
   Abgleichband

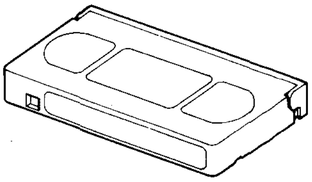
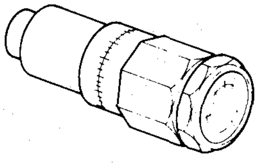
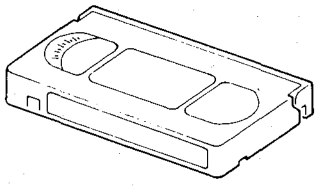
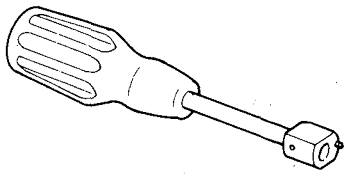
JVC-Abgleichband MH-2, MH-2L 	Drehkraftmessungs-Baugruppe PUJ48075-2 (Drehkraft-Meßuhr: 600ATG Drehkraft-Meßkopf: PUJ48016-2) 	Bandzug-Meßcassette PUJ48076-2 
A/CTL Kopfpositionierungs-Werkzeug PUJ47351-2 		

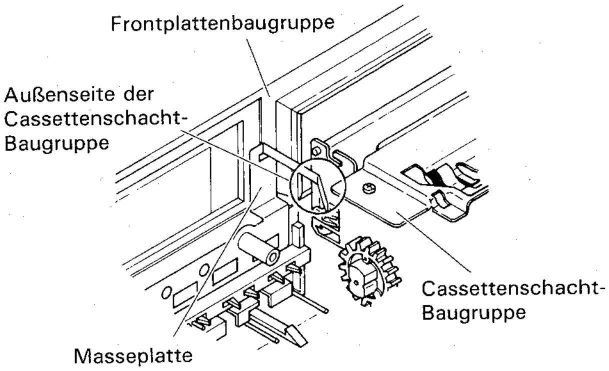
Tabelle 1-1-1 Werkzeuge und Einstellehren

1.1.3 Demontage (Gehäuse)

1. Oberabdeckung
1) Fünf Schrauben von der linken, rechten und hinteren Seite des Gerätes abnehmen.
2) Das hintere Ende der Oberabdeckung zuerst abheben, und dann die Abdeckung ganz abnehmen.

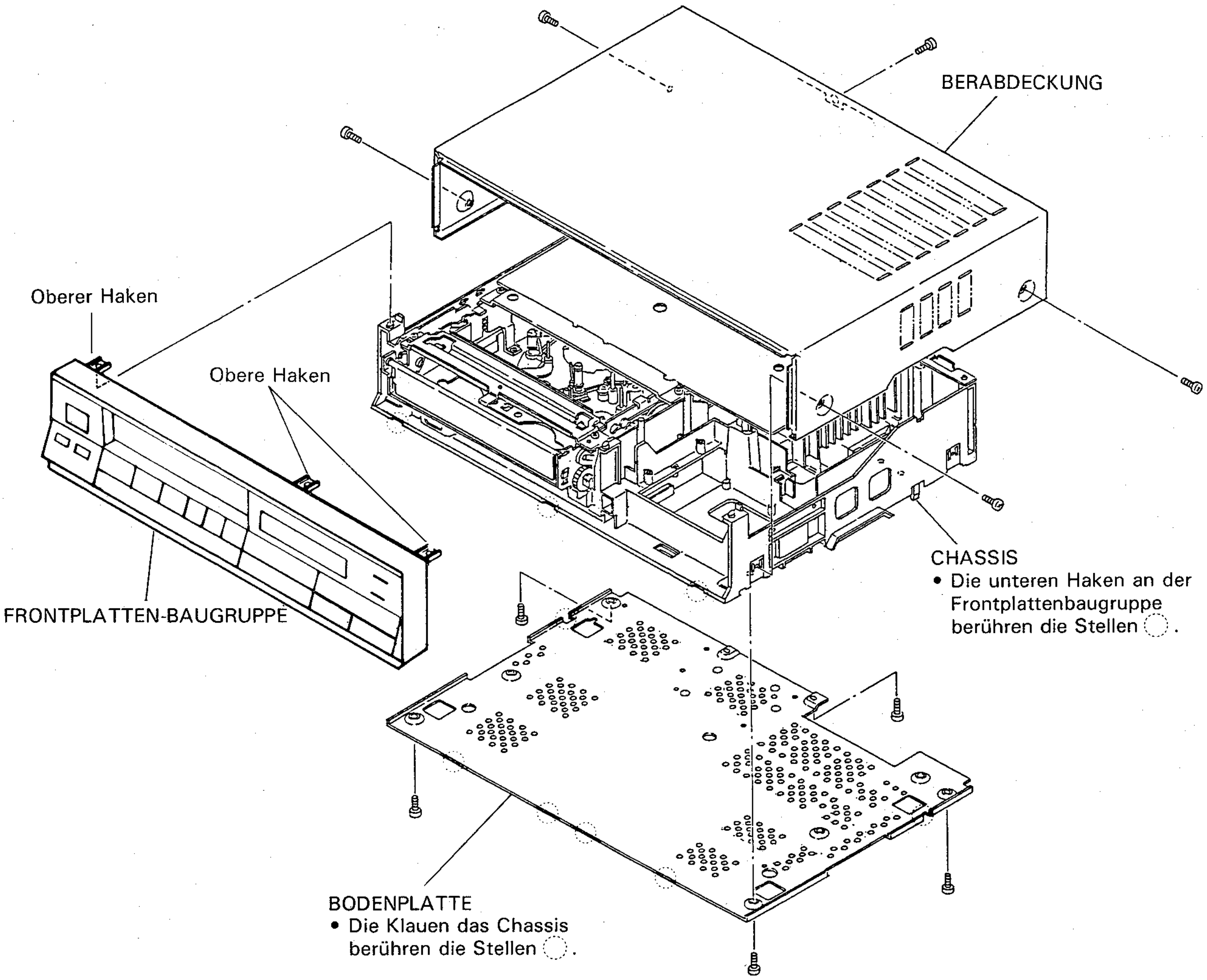
2. Bodenplatte
1) Fünf Schrauben von der Bodenplatte des Geräts abnehmen.
2) Die Bodenplatte von den sechs Klauen am Chassis lösen, um sie abzunehmen.

3. Frontplattenbaugruppe
1) Die Oberabdeckung abnehmen.
2) Drei obere Haken der Frontplattenbautruppe aus ihren Chassishalterungen nach oben biegen, um die Haken vom Chassis zu lösen.
3) Die drei unteren Haken von der Unterseite des Geräts lösen, um die Frontplattenbaugruppe vom Chassis abzunehmen.
4) Die Frontplattenbaugruppe so zusammenbauen, daß die Masseplatte an der Rückseite die Außenseite der Cassettenschacht-Baugruppe wird. (Siehe Abb. 1-2-2)



Frontplattenbaugruppe
Außenseite der Cassettenschacht-Baugruppe
Cassettenschacht-Baugruppe
Masseplatte

Abb. 1-1-2



BERABDECKUNG
Oberer Haken
Obere Haken
FRONTPLATTEN-BAUGRUPPE
CHASSIS
• Die unteren Haken an der Frontplattenbaugruppe berühren die Stellen ◌.
BODENPLATTE
• Die Klauen das Chassis berühren die Stellen ◌.

Abb. 1-1-1 Abnehmen der Außenabdeckung

1.1.4 Anordnung der Haupt-Teile

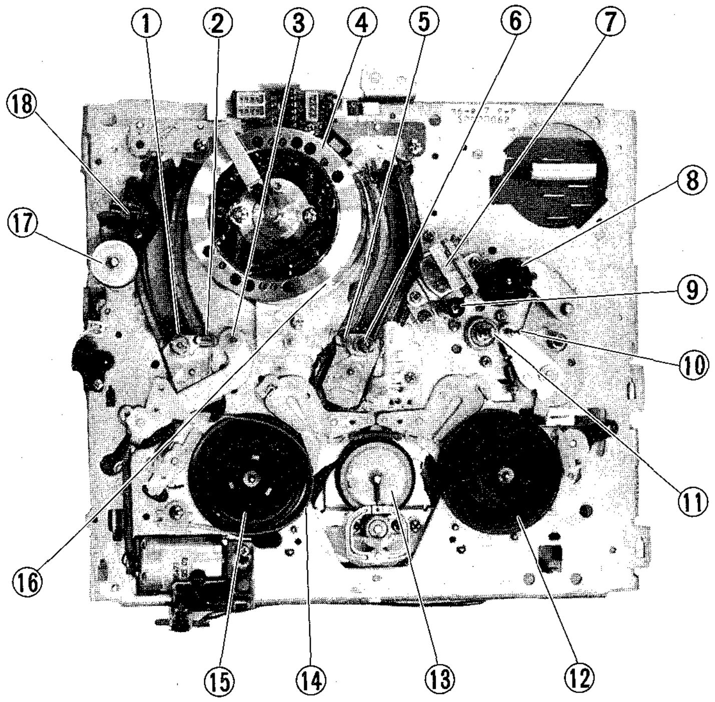


Abb. 1-1-3 Haupt-Deck von oben gesehen

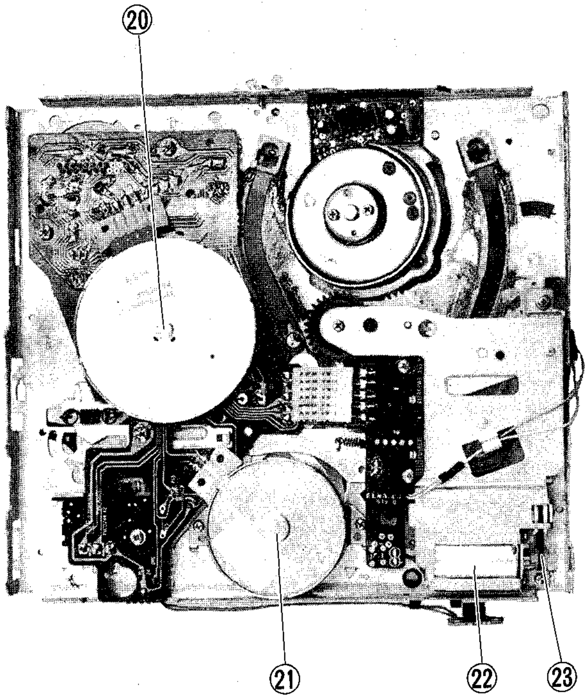


Abb. 1-1-4 Haupt-Deck von unten gesehen

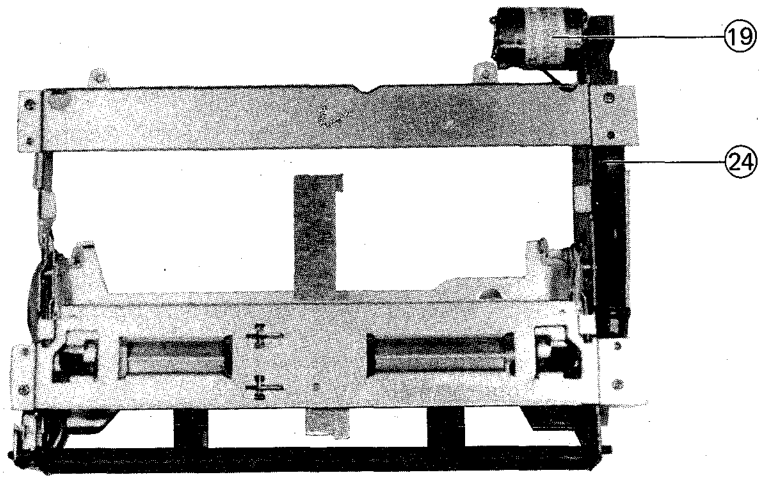


Abb. 1-1-5 Cassettenschacht

1. Abwickel-Führungsrolle
2. Abwickel-Kipprolle
3 Bandzugfühlstift
4. Kopftrommel
5. Aufwickel-Kippstift
6. Aufwickel-Führungsrolle
7. Audio/Kontrollkopf (A/C)
8. Andruckrolle
9. Aufwickel-Führungsstift
10. Führungsarm
11. Capstanwelle
12. Aufwickel-Bandteller
13. Spulenkupplung
14. Bremsband
15. Abwickel-Bandteller
16. Untere Trommel
17. Impedanzrolle
18. Vollöschkopf
19. Cassettenmotor
20. Capstanmotor
21. Spulenmotor
22. Betriebsartenmotor
23. Motorsteuerriemen
24. Cassettenriemen

1.2 AUSTAUSCH DER HAUPTBAUGRUPPEN

1.2.1 Obere Trommel

Hinweis: Bei der Handhabung und beim Einbau der Kopftrommel-Baugruppe nicht direkt die Kopfspitzen auf der Kopfbaugruppe beühren.
Zum Reinigen der Kopfspitzen ein fusselfreies Tuch oder ein Polierleder, mit Alkohol befeuchtet, mit der Hand an die Kopftrommel andrücken, und dann die Kopftrommel im Uhrzeigersinn drehen. Nicht die Kopftrommel-Baugruppe in vertikaler Richtung abwischen.

1. Ausbau
1) Eine Schraube abnehmen und die Bürsten-Baugruppe von der Trommel-Baugruppe abnehmen.
2) Alle Lötstellen auf der Trommel-Verdrahtungsplatte abflöten. Allen überflüssigen Lötzinn entfernen und dann die Trommel-Verdrahtungsplatte von der Kopftrommel-Baugruppe abnehmen.
   Hinweis: Lötstellen können leicht mit Lötzinnsauger oder Sauglitze entfernt werden.
3) Zwei Schrauben abnehmen und die Kopftrommelbaugruppe nach oben abziehen.

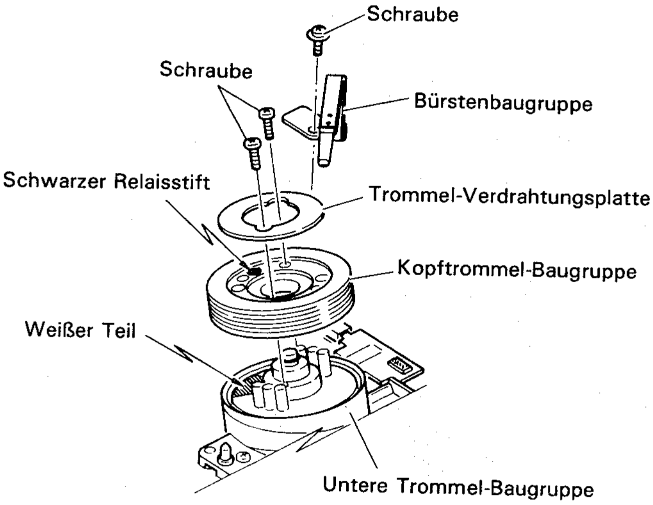

Schraube
Schraube
Bürstenbaugruppe
Schwarzer Relaisstift
Trommel-Verdrahtungsplatte
Kopftrommel-Baugruppe
Weißer Teil
Untere Trommel-Baugruppe

Abb. 1-2-1 Kopftrommel-Baugruppe

2. Einbau
1) Eine neue Kopftrommel-Baugruppe einbauen, so daß der schwarze Relaisstift auf der oberen Kopftrommel-Baugruppe den weiß lackierten Teil der unteren Trommel-Baugruppe überlappt, wie in Abb. 1-2-1 gezeigt.
2) Zwei Schrauben gleichmäßig anziehen.
3) Die Trommel-Verdrahtungsplatte auf die Kopftrommel-Baugruppe aufsetzen und dann neu verlöten.
4) Die Trommel-Einheit reinigen (besonders die Kopftrommel-Baugruppe).
5) Die Bürsten-Baugruppe in Originalstellung anbringen und dann mit einer Schraube befestigen.

3. Prüfungen und Einstellungen
1) Die Austauschbar Veit überprüfen. Siehe Abschnitt 1.6.
2) Die Platinen-Schaltpunkteinstellung der Servoschaltung (Video Leiterplatte) durchführen. Siehe Abschnitt 2.2.1.

1.2.2 Audio/Kontrollkopf (A/C)

1. Ausbau
1) Die Anschlüsse von der Audio/Kontrollkopf-Verdrahtungsplatte abnehmen.
2) Die beiden Schrauben herausnehmen, und dann den Audio/Kontrollkopf zusammen mit der Kopfbasis entnehmen.
3) Die Audio/Kontrollkopf-Verdrahtungsplatte vom Audio/Kontrollkopf freilöten und herausnehmen.
4) Eine Schraube abnehmen und die Abschirmkappe vom Audio/Kontrollkopf entfernen.
5) Drei Schrauben herausnehmen und den Audio/Kontrollkopf von der Kopfbasis abnehmen. Die Federn vorsichtig behandeln und nicht verlieren.

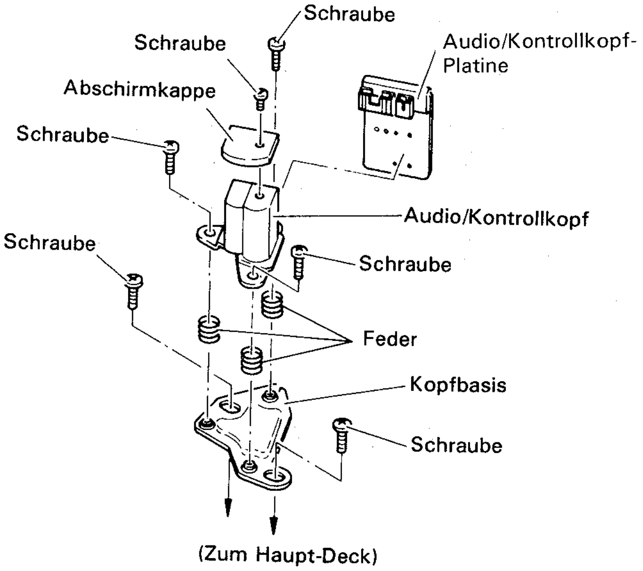

Schraube
Schraube
Audio/Kontrollkopf-Platine
Abschirmkappe
Schraube
Audio/Kontrollkopf
Schraube
Schraube
Feder
Kopfbasis
Schraube
(Zum Haupt-Deck)

Abb. 1-2-2 Audio/Kontrollkopf

2. Einbau
1) Einen neuen Audio/Kontrollkopf und andere Peripherieteile auf dem Haupt-Deck anbringen. Dabei in umgekehrter Reihenfolge die Ausbauschritte wiederholen.
2) Vor dem Einbau des Audio/Kontrollkopfes auf dem Haupt-Deck die Grobeinstellung des Audio/Kontrollkopfes wie in Abb. 1-2-3 gezeigt durchführen.

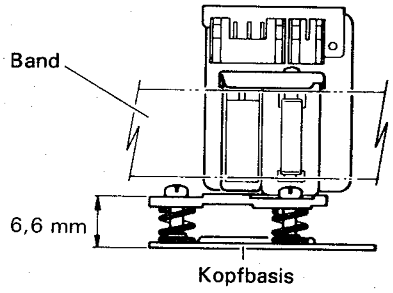

Band
6,6 mm
Kopfbasis

Abb. 1-2-3 Audio/Kontrollkopf-Höhe

3. Prüfung und Einstellung
1) Mit einem Aufnahmeband den richtigen Bandtransport überprüfen, und dann die Austauschbarkeitsprüfung vornehmen. Siehe Kapitel 1.5 und 1.6.

1.2.3 Bremsband-Baugruppe

1. Ausbau

1) Eine Schraube herausnehmen und denn den Teil A der Bremsband-Baugruppe nach oben hebeln, um ihn von der Bremsband-Baugruppe zu trennen.

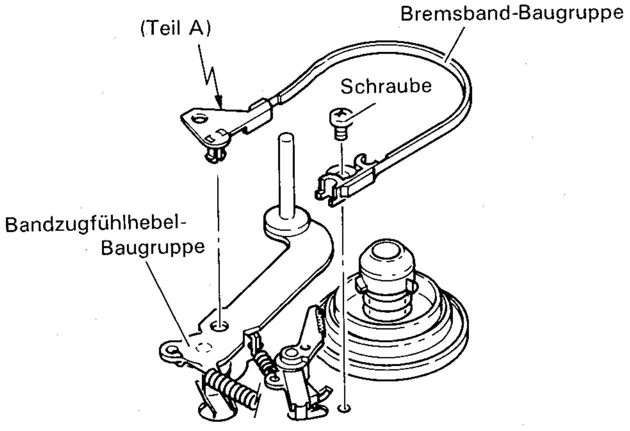

(Teil A)
Bremsband-Baugruppe
Schraube
Bandzugfühlhebel-Baugruppe

Abb. 1-2-4 Bremsband-Baugruppe

2. Einbau

1) Eine neue Bremsband-Baugruppe einbauen und dabei die Schritte des Ausbaus in umgekehrter Reihenfolge wiederholen.

3. Prüfung und Einstellung

1) Die Bandzugfühlhebeleinstellung überprüfen. Siehe Abschnitt 1.4.1.

1.3 MONTAGE DES MECHANISMUS

Der Mechanismus dieses Modells wird hauptsächlich über den Betriebsarten-Wahlschalter von der Mechanismus-Steuerlogik gesteuert. Darum entscheidet die Beziehung zwischen Wahlschalter und Steuerarm alle mechanischen Bewegungen von Teilen wie Hebeln, Zahnrädern, Walzen usw. Wenn diese Teile nicht richtig positioniert sind, läuft die Einheit ohne Last oder wird blockiert. Dadurch können Schäden an mechanischen oder elektrischen Teilen entstehen.

1.3.1 Ladearm-Baugruppe

Die Ladearm-Baugruppe besteht aus dem Ladezahnrad, der Spannfeder und dem Ladearm.

1. Die Ladearm-Baugruppe richtig einsetzen, wie in Abb. 1-3-1 gezeigt.

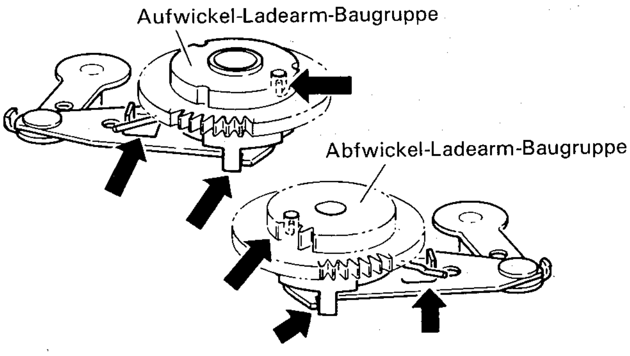

Aufwickel-Ladearm-Baugruppe
Abfwickel-Ladearm-Baugruppe

Abb. 1-3-1 Ladearm-Baugruppe (1)

2. Die Aufwickel-Ladearm-Baugruppe und die Abwickel-Ladearm-Baugruppe so einbauen, daß die Löcher auf den Ladezahnrädern einander gegenüberstehen, wie in Abb. 1-3-2 gezeigt. Nicht die Ladearm-Baugruppen für den nächsten Schritt aus dieser Stellung bewegen.

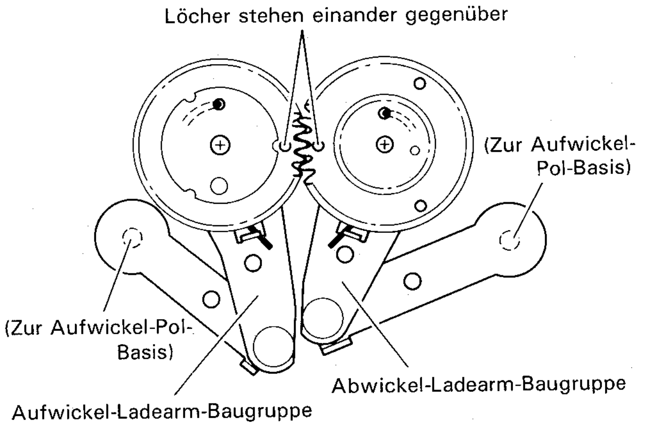

Löcher stehen einander gegenüber
(Zur Aufwickel-Pol-Basis)
(Zur Aufwickel-Pol-Basis)
Abwickel-Ladearm-Baugruppe
Aufwickel-Ladearm-Baugruppe

Abb. 1-3-2 Ladearm-Baugruppe (2)

1.3.2 Steuernocke

1. Die Armzahnrad-Baugruppe auf der Nockenklammer-Baugruppe so anbringen, daß das Loch der Armzahnrad-Baugruppe das Loch der Klammer-Baugruppe überlappt.
2. Die Steuernocke so auf der Nockenklammer-Baugruppe anbringen, daß das Loch der Steuernocke das Loch, das in Schritt 1) gezeigt ist überlappt, wie in Abb. 1-3-3 gezeigt. Nicht die Steuernocke für den nächsten Schritt aus dieser Stellung verdrehen.

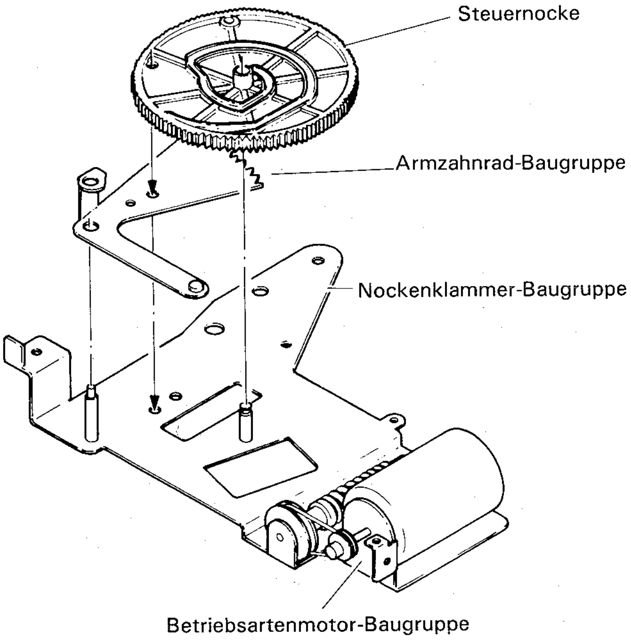

Steuernocke
Armzahnrad-Baugruppe
Nockenklammer-Baugruppe
Betriebsartenmotor-Baugruppe

Abb. 1-3-3 Steuernocke

1.3.3 Nockenklammer-Baugruppe

1. Die Platten-Baugruppe drücken und so halten, daß das Loch der Platten-Baugruppe das Loch des Haupt-Decks überlappt, wie in Abb. 1-3-4 gezeigt.
2. Dann die Nockenklammer-Baugruppe anbringen.

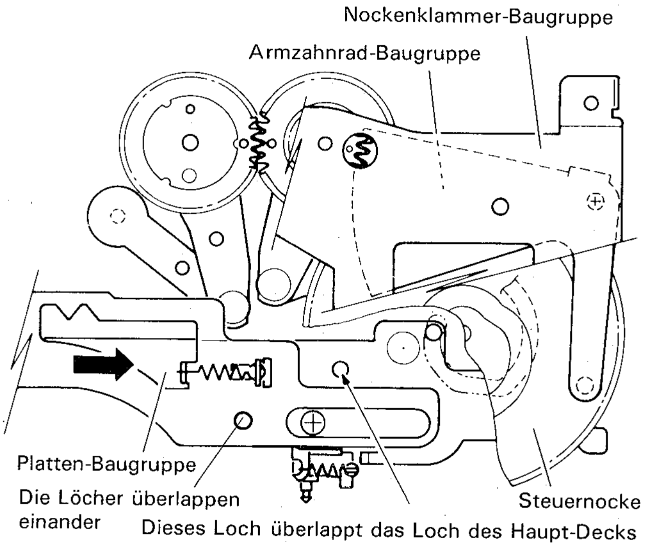

Nockenklammer-Baugruppe
Armzahnrad-Baugruppe
Platten-Baugruppe
Die Löcher überlappen einander
Dieses Loch überlappt das Loch des Haupt-Decks
Steuernocke

Abb. 1-3-4 Nockenklammer-Baugruppe

Hinweis: Um die Löcher überlappen zu lassen, die Steuernocke durch Drehen des Betriebsartenmotors mit dem Finger ganz gegen den Uhrzeigersinn drehen.

1.3.4 Betriebsartenschalter

1. Wenn das Loch der Platten-Baugruppe mit dem Loch des Haupt-Decks überlappt, bestätigen daß die V-Kerbe des Schiebers gerade mit der V-Kerbe der Außensektion des Betriebsartenschalter überlappt, wie in Abb. 1-3-4 gezeigt.
2. Wenn die Abweichung mehr als 0,5 mm beträgt, die Schraube freilöten und lösen und den Betriebsartenschalter richtig einstellen.

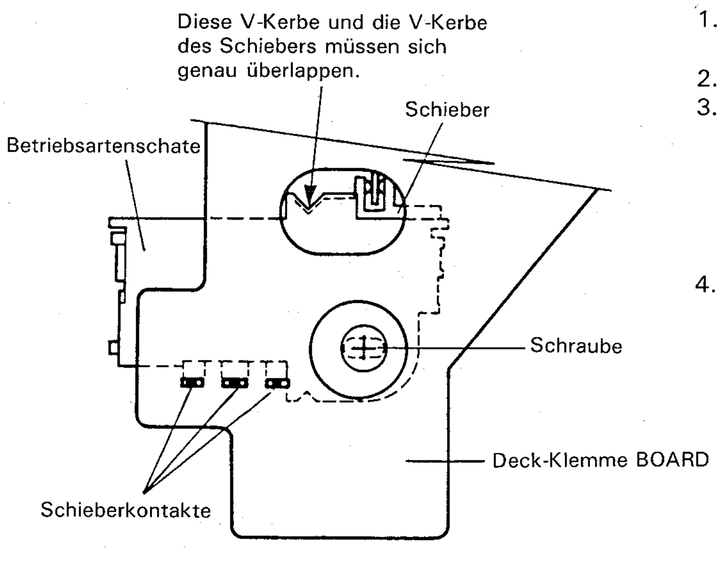

Diese V-Kerbe und die V-Kerbe des Schiebers müssen sich genau überlappen.
Schieber
Betriebsartenschate
Schraube
Deck-Klemme BOARD
Schieberkontakte

Abb. 1-3-5 Betriebsartenschalter

1.4 ANORDNUNG UND EINSTELLUNG

1.4.1 Bandzugfühlhebelposition-Einstellung

1. Ohne eingelegtes Band die Abspiel-Betriebsart einstellen.
2. Die Schraube leicht lösen und dann den Bremsbandlhalter so einstellen, daß der Abstand, wie in Abb. 1-4-1 gezeigt, Null wird (0 mm).
3. Die Schraube festziehen, um den Bremsbandlhalter zu befestigen.

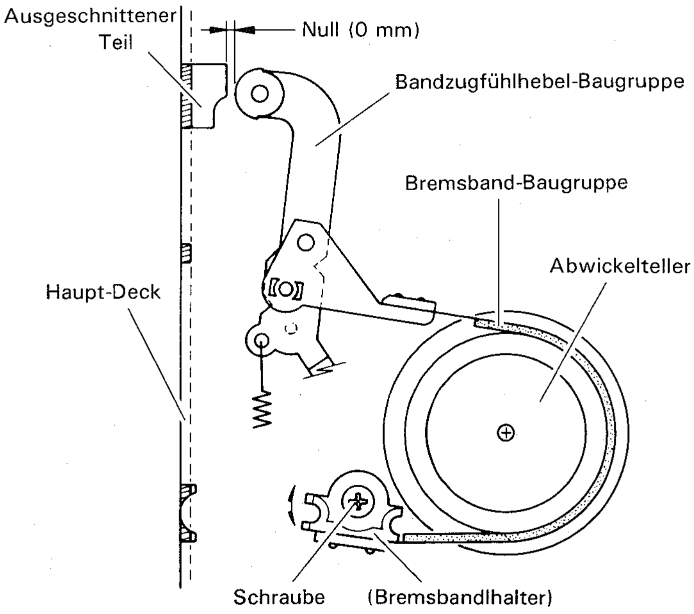

Ausgeschnittener Teil
Null (0 mm)
Bandzugfühlhebel-Baugruppe
Bremsband-Baugruppe
Abwickelteller
Haupt-Deck
Schraube
(Bremsbandlhalter)

Abb. 1-4-1 Bandzugfühstiftposition

Hinweis: Mit dieser Einstellung wird die Bandspannung auf zulässigen Wert eingestellt, trotz Teile-Ungenauigkeiten.

4. Die Bandzug-Meßcassette verwenden und auf Abspiel-Betriebsart einstellen.
5. Sicherstellen, daß die Anzeige zwischen 25 und 75 g-cm liegt.

1.4.2 Aufwickeldrehkraftprüfung

1. Auf Abspiel-Betriebsart stellen, ohne daß eine Cassette eingelegt ist.
2. Den Drehkraftmesser auf den Aufwickel-Bandteller legen.
3. Der Drehkraftmesser besteht aus einem oberen und unteren Teil, verbunden mit einem Federmechanismus. Den Griff des Drehkraftmessers so lösen, daß die Anzeigenadel und Skala sich mit gleicher Geschwindigkeit drehen, und dann die Anzeige ablesen. Der Richtwert beträgt zwischen 45 und 155 g-cm.
4. Wenn der Meßwert nicht dem Richtwert entspricht, die Aufwickel- und Abwickelkupplungen austauschen.

1.5 PRÜFUNGEN UND JUSTIERUNGEN DES BANDTRANSPORTSYSTEMS

Wenn das Bandtransportsystem einmal genau abgestimmt worden ist, dann sind normalerweise keine Nachstellungen erforderlich. Die folgenden Überprüfungen sind nur erforderlich, wenn Teile, die das Bandtransportsystem betreffen, wegen Schäden oder Verschleiß ausgetauscht werden.

1.5.1 Justierungen des Bandtransportsystems

1. Führungsrollen
   Die Höheneinstellung der Führungsrollen ist erforderlich, um eine FM-Hüllkurve-Linearität am Trommeleingang und Ausgang bei Austauschbarkeit-Einstellungen zu erzielen. Zur Höheneinstellung der Führungsrollen die Stellschraube (1,25 mm Sechskant) lösen und die Führungsrolle mit einem Schraubenzieher drehen.
   Hinweis: Die Stellschraube genug lösen, um die Führungsrolle drehen zu können. Wenn sie zu lose ist, kann durch die Bandbewegung die Führungsrolle gedreht werden.

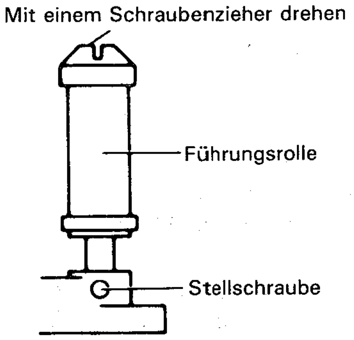

Mit einem Schraubenzieher drehen
Führungsrolle
Stellschraube

Abb. 1-5-1 Führungsrolle

2. Impedanzrolle
   Normalerweise braucht die Höhe der Impedanzrolle nicht eingestellt zu werden. Nur wenn Defekte beim Bandlauf an der Impedanzrolle nach der vollständigen Einstellung für Austauschbarkeit festgestellt werden, dann muß die Höhe der Impedanzrolle für glatten Bandlauf eingestellt werden. Zur Einstellung der Impedanzrollenöhe einen Mutterndreher (5,5 mm) verwenden.
   Hinweis: Nicht die Impedanzrolle zu niedrig einstellen, um Defekte beim Bandlauf zu vermeiden. Das Band muß am unteren Flansch unter der Impedanzrolle entlang laufen.

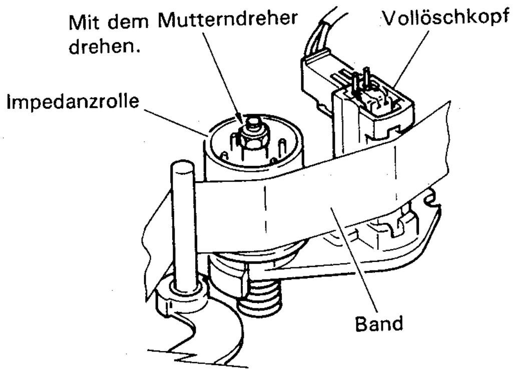

Mit dem Mutterndreher drehen.
Vollöschkopf
Impedanzrolle
Band

Abb. 1-5-2 Impedanzrolle

3. Audio/Kontrollkopf (A/C)
   Wenn Defekte beim Bandlauf auf dem Aufwickel-Führungsstift festgestellt werden, die Neigung des Audio/Kontrollkopfes nachstellen, um glatten Bandlauf zu erzielen.

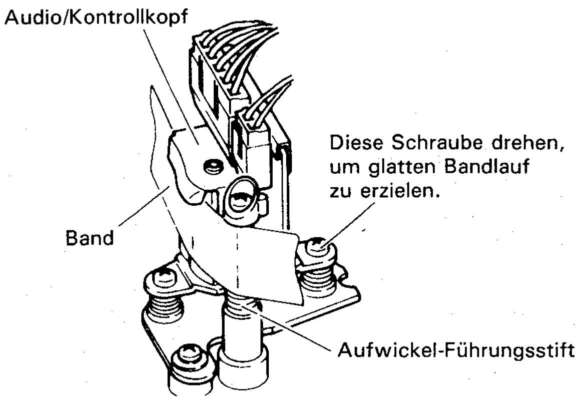

Audio/Kontrollkopf
Diese Schraube drehen, um glatten Bandlauf zu erzielen.
Band
Aufwickel-Führungsstift

Abb. 1-5-3 Audio/Kontrollkopf

1.6 PRÜFUNGEN UND JUSTIERUNGEN ZUR AUSTAUSCHBARKEIT

Vor der Verwendung des teuren Abgleichbandes ein Normalband verwenden und sicherstellen, daß der Bandtransport richtig funktioniert.
Für die FM-Hüllkurvenausgabe ein Oszilloskop an TP106 der Video-Leiterplatte anschließen. Für Ton-Ausgabe an die Klemme AUDIO OUT anschließen und das Oszilloskop extern mit dem Signal von TP11 der Servo-Leiterplatte triggern. Nur das Grautreppensignal des Abgleichbandes und kein anderes verwenden, um Austauschbarkeit zu gewährleisten.

1.6.1 Prüfung und Justierung der FM-Hüllkurve

1. Die Tasten TRACKING +/− drücken, um die maximale FM-Hüllkurvenausgabe, entsprechend Pegel (a) in Abb. 1-6-1 zu gewährleisten. Die FM-Hüllkurve beobachten und den Maximumpegel (a) und die Minimumpegel (b), (c) und (d) ablesen.
   Bestätigen, daß:

$$\frac{b}{a} \geqq 0{,}7, \quad \frac{c}{a} \geqq 0{,}5 \text{ und } \frac{d}{a} \geqq 0{,}5$$

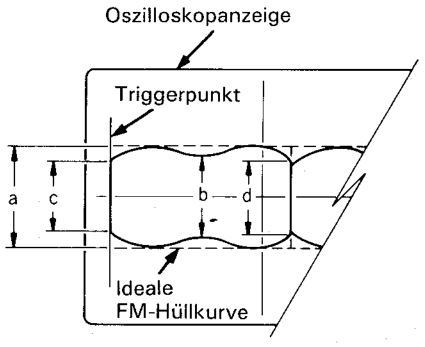


Abb. 1-6-1 FM-Hüllkurve

2. Wenn Fehler gefunden werden, sind die folgenden Einstellungen erforderlich.

1) Die Oszilloskopanzeige beobachten und die Tasten TRACKING +/− drücken, um den FM-Ausgang von Maximum auf Minimum umzustellen.
2) Wenn die Veränderung am ansteigenden Teil (Trommeleingang) der FM-Hüllkurve nicht parallel ist, die Abwickel-Führungsrolle so drehen, daß der steigende Teil der Hüllkurve fast flach wird, wie in Abb. 1-6-2 gezeigt.

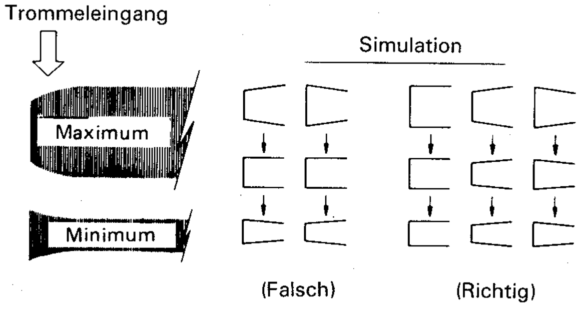


Abb. 1-6-2 Trommeleingang

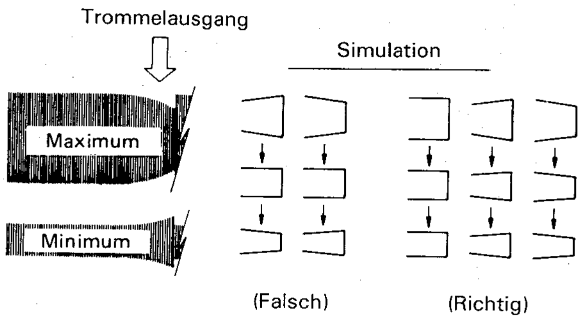


Abb. 1-6-3 Trommelausgang

3) Auf gleiche Weist wie beim ansteigenden Teil die Aufnahme-Führungsrolle so drehen, daß der sinkende Teil (Trommelausgang) der Hüllkurve eingestellt wird. Siehe Abb. 1-6-3.
4) Außer der Beobachtung der Hüllkurve auch im Hinblick auf Bandknicke oder Falten an Abwickel- oder Aufwickelstift überprüfen. Wenn diese an der Impedanzrolle auftreten, die Impedanzrollenhöhe einstellen. Wenn sie am Aufwickelstift auftreten, die Neigung des Audio/Kontrollkopfes nachstellen.
5) Den Ausgangspegel der FM-Hüllkurve verändern und Feineinstellungen an den Führungsrollen vornehmen.

1.6.2 Einstellung von Höhe und Azimut des Audio/Kontrollkopfs

Falsche Einstellung des Audio/Kontrollkopfs reduziert den Signal-Rauschabstand bei der Wiedergabe von bespielten Bändern.

1. Zur Einstellung der Neigung des Audio/Kontrollkopfes die Schraube (A) so einstellen, daß nicht kleine Bandfalten am Aufwickelstift entstehen. Die Schraube (A) im Uhrzeigersinn drehen, so daß Bandfalten am unteren Teil des Aufwickelstiftes auftreten und dann Schraube (A) gegen den Uhrzeigersinn drehen, bis die Falten verschwinden.
2. Azimuteinstellung mit Schraube (B).
   Die Schraube (B) drehen, um maximalen Audioausgang zu erzielen.
3. Zur Einstellung der Neigung des Audio/Kontrollkopfes die Schrauben (A), (B) und (C) nacheinander in kleinen Schritten einstellen, bis maximaler Audioausgang erzielt wird.

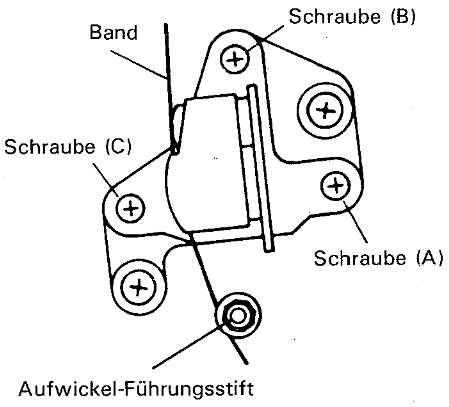


Abb. 1-6-4 Audio/Kontrollkopf

1.6.3 Kontrollkopf-Phaseneinstellung

1. Den Tracking-Regler durch gleichzeitiges Drücken der Tasten + und − auf Ausgangsposition stellen.
2. Die Schrauben (D) und (E) ein wenig lösen und dann die Schraube (D) mit dem Kopfpositionierungs-Werkzeug abdecken und den Stift des Werkzeugs in das Loch neben der Schraube (D) stecken.
3. Das Werkzeug gegen den Uhrzeigersinn drehen, um den Audio/Kontrollkopf ganz zur Capstan-Seite zu drehen, und dann langsam im Uhrzeigersinn drehen und dabei die FM-Hüllkurvenausgabe beobachten.
4. Den Audio/Kontrollkopf auf den ersten Ausgabe-Höhepunkt stellen.

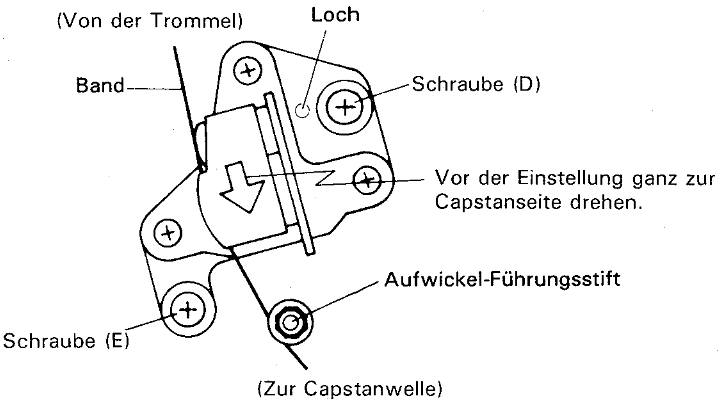


Abb. 1-6-5 Kontrollkopf-Phaseneinstellung

5. LP-Tracking-Justage
   1) Ein Oszilloskop an TP106 (PB FM) an der Videoplatine anschließen.
   2) Das Grautreppen-Segment des MH-2L-Ausrichtbands abspielen.
   3) Die TRACKING-Steuerung (R401) der OPERATION-Platine zur Veränderung des FM-Ausgangspegels justieren und vergewissern, daß der FM-Spitzenpegel an der voreingestellten Tracking-Position erreicht wird.
   4) Wird der FM-Spitzenpegel an der voreingestellten Tracking-Position nicht erreicht, ist R46 auf maximalen FM-Pegel zu justieren.

1.6.4 Festziehen der Stellschraube

1. Nach der Bestätigung, daß keine Bandfalten und andere Transportstörungen bestehen, die Stellschrauben unter den Führungsrollen in Stopp-Betriebsart festziehen.
   Hinweis: Da die Führungsrollen leicht verschiebbar sind, beim Festziehen vorsichting vorgehen.
2. Die FM-Hüllkurve erneut überprüfen.

1.6.5 Schlußprüfungen

1. Ein Videosignal anlegen, eine Aufnahme durchführen und anschließend wiedergeben.
   Bestätigen, daß die FM-Hüllkurve den Spezifikationen der Wiedergabe des Abgleichbandes MH-2 entspricht.
2. Die Wiedergabe-Schaltpunkteinstellung der Servoschaltung durchführen. Siehe Abschnitt 2.2.1.
3. Die Audio-Wiedergabepegeleinstellung der Audioschaltung durchführen. Siehe Abschnitt 2.4.2.
4. Die Gesamtleistung der Videoschaltung prüfen. Siehe Abschnitt 2.3.

ABSCHNITT 2
ELEKTRISCHE EINSTELLUNGEN

2.1 VORBEREITUNG

Elektrische Einstellungen sind erforderlich, nachdem Schaltkreisbauteile und bestimmte mechanische Teile ausgetauscht wurden.
Es ist wichtig, daß diese Einstellungen nur nach Beendigung aller Reparaturen und Austauschmaßnahmen durchgeführt werden. Diese Einstellungen außerdem nur vornehmen, wenn geeignete Ausrüstung zur Verfügung steht.

2.1.1 Erforderliche Prüfgeräte

1. Farbfernseher oder Monitor
2. Oszilloskop: Zweikanaloszilloskop mit verzögerter Zeitbasis
3. Frequenzzähler
4. Audio-Oszillator
5. Audio-Voltmeter
6. Digital-Voltmeter
7. Signalgenerator: HF/ZF-Wobbler
8. Singalgenerator: PAL-Farbgenerator
9. Aufnahmeband
10. Abgleichbänder: (MH-2, MH-2L)
11. LP-Einstellplatten-Halterung (PUJ61839)
12. REG FXT Platinenbaugruppe (PUJ37697B)
13. Platinenerweiterung (PUJ96003P)

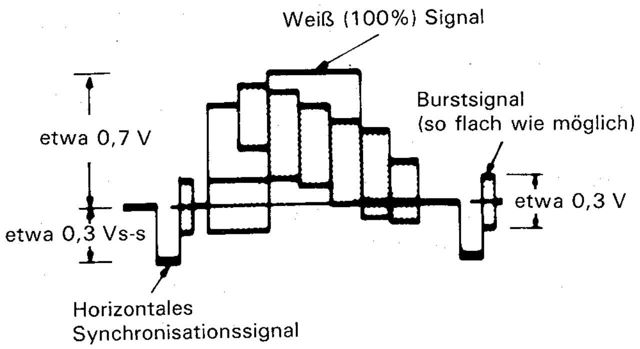

Weiß (100%) Signal
Burstsignal
(so flach wie möglich)
etwa 0,7 V
etwa 0,3 V
etwa 0,3 Vs-s
Horizontales
Synchronisationssignal

Abb. 2-1-1 Farbbalken vom Farbgenerator

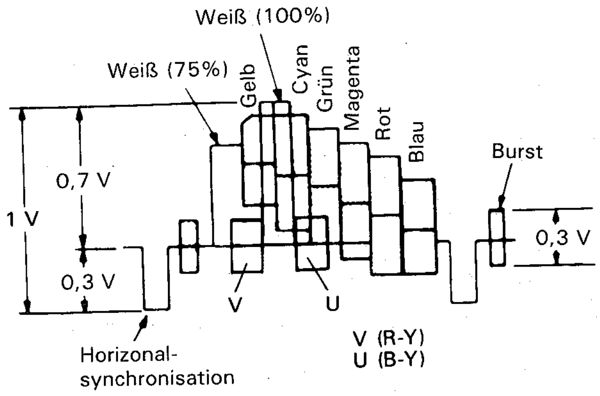

Weiß (100%)
Weiß (75%)
Gelb
Cyan
Grün
Magenta
Rot
Blau
Burst
0,7 V
1 V
0,3 V
0,3 V
V
U
V (R-Y)
U (B-Y)
Horizonal-
synchronisation

Abb. 2-1-2 Farbbalkensignal-Hüllkurve (MH-2)

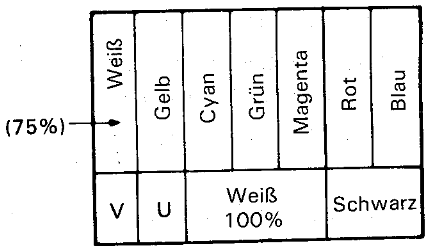

(75%)
Weiß
Gelb
Cyan
Grün
Magenta
Rot
Blau
V
U
Weiß
100%
Schwarz

Abb. 2-1-3 Farbbalken (MH-2)

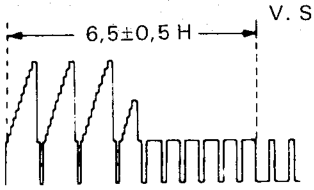
2.1.2 Prüfungs-und Justierungsschritte

Im folgenden werden die Prüfungs-und Justierungsschritte in Form von Tabellen dargestellt. Die Bedeutungen der Abkürzungen und Bezeichnungen, die in den Tabellen verwendet werden, sind im folgenden erläutert.

Nr.	Prüfungen und Justierungen sind in der empfohlenen Reihenfolge der Durchführung nummeriert.
Einstellung	Die Bezeichnung des jeweiligen Prüfungs- und Justierungsschrittes.
Meßpunkt	Stelle, an der das Meßinstrument (wenn nicht anders angegeben, das Oszilloskop) angeschlossen wird.
Einstellpunkt	Bauteil (Widerstand, Kondensator usw.) der in diesem Schritt eingestellt wird. Nur ein Gedankenstrich (—) bedeutet nur Prüfung.
Betriebsart Eing.-signal	• Eingangssignal, das zur Durchführung erforderlich ist. Gedankenstrich (—) bedeutet, daß kein besonderes Signal erforderlich ist. • Betriebsart zur Zeit der Einstellung der Prüfung.
Beschreibung	In dieser Spalte werden die Arbeitsschritte erklärt und Hinweise und Einstellwerte gegeben.
Farbbalken	Farbbalkensignal als Videoeingang.
Grautreppe	Grautreppensignal als Videoeingang.
1 kHz	Eine 1 kHz-Sinuswelle als Audio-Eingangssignal anlegen.
MH-2 Farbbalken	Das Farbbalken-Segment des Abgleichbandes MH-2 abspielen.
MH-2 Grautreppe	Das Grautreppen-Segment des Abgleichbandes MH-2 abspielen.
MH-2 1 kHz	Das 1 kHz-Audiosignal Segment des Abgleichbandes MH-2 abspielen.
MH-2 HF-Wobbelsignal	Das HF-Wobbelsignal Segment des Abgleichbandes MH-2 abspielen.
MH-2L Farbbalken	Das Farbbalkensegment des Abgleichbandes MH-2L abspielen.
MH-2L Grautreppe	Das Grautreppensegment des Abgleichbandes MH-2L abspielen.
Stopp	Gerät eingeschaltet und in Stopp-Betriebsart
REC	Aufnahme-Betriebsart
PB	Abspiel-Betriebsart
REC ↓ (andere Betriebsart)	Ein unbespieltes Band verwenden, bespielen, und dann in der angegebenen Betriebsart abspielen.
Suchlauf	Suchlauf-Betriebsart (FWDS und REVS)
Zeitlupe	Zeitlupe-Betriebsart
Standbild	Wiedergabe, dann Pause.
A DUB	Audio-Überspiel-Betriebsart.

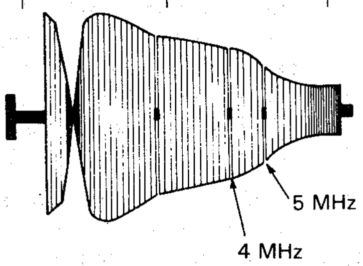
2.2 SERVO-SCHALTUNG ($\boxed{0}\boxed{8}$ SERVO Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der SERVO Platte.
Vor dieser Einstellung muß die "Einstellung von Steuerkofphase" durchgeführt sein.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	PB Schaltpunkt  Abb. 2-2-1	CN102 Pin 1	R79 (SP PB SW POINT)	•PB •MH-2 Grautreppe •Negative Triggerflanke (–) •SP-Betriebsart	1. Ein Oszilloskop an CN102 Pin 1 der Hauptplatine MAIN anschließen. 2. Das Grautreppen-Segment des Abgleichbandes MH-2 abspielen. 3. Das Oszilloskop extern (negative Triggerflanke) mit dem Signal von TP11 von der Hauptplatine triggern (DRUM FF). 4. R79 so einstellen, daß der Triggerpunkt 6,5±0,5 H von V. sync. entfernt ist.
		TP401 oder Q106-b	R35 (LP PB SW POINT)	•PB •MH-2L Grautreppe •Triggerflanke (–) •LP-Betriebsart	5. Die Einstellung auf gleiche Weise durchführen wie bei der SP-Betriebsart. 6. Ein Oszilloskop an TP401 oder Q106-b anschließen. Das Grautreppensignal des Abgleichbandes MH-2 abspielen. 7. R35 einstellen, um den Triggerpunkt 6,5 ±0,5 H von V. Sync. einzustellen.
2	V. Impulsposition	MONITOR	R1 $\boxed{0}\boxed{6}$ TERMINAL-Platine	•Standbild •REC und dann PB •Farbbalken •SP-Betriebsart	1. Das Farbbalken-Signal aufnehmen, und dann abspielen. 2. Den Monitor in Standbild-Betriebsart beobachten und R1 so einstellen, daß ver tikales Zittern minimiert wird.
3	LP-Tracking	R46	TP106	•LP-Betriebsart	**Hinweis:** Vergleiche Abschnitt 1.6.3.

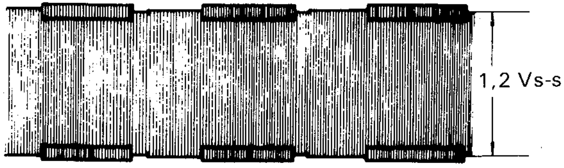
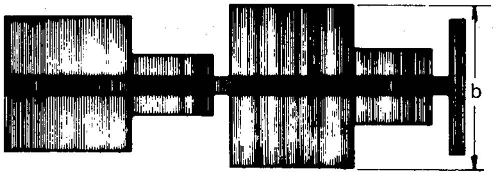
2.3 PRE/REC-SCHALTUNG ($\boxed{4}\boxed{3}$ PRE/REC-Platine)

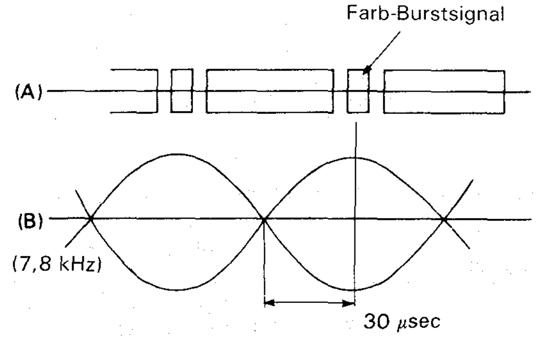
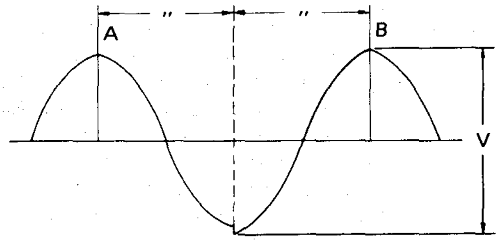
Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der PRE/REC Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Resonanz- und Qualitätsfaktor der Videoköpfe  Abb. 2-3-1	TP5	R2, CH1 C7 R1, CH2, C5	•SP-Betriebsart •MH-2 HF-Ablenkung •PB	1. Ein Oszilloskop an TP5 anschließen und das Oszilloskop extern mit dem Signal von TP11 an der Platine SERVO triggern. Die negative Triggerflanke für CH1 und die positive Triggerflanke für CH2 verwenden. 2. Das HF-Ablenksegment des Abgleichbandes MH-2 abspielen. Den Tracking-Regler (R401) der Platine OPERATION auf dem Maximalpegel für HF-Ablenkung stellen. 3. R1 und R2 so drehen, daß sie nicht dämpfen. C5 und C7 so einstellen, daß die Resonanzpunkte von CH1 und CH2 auf 5 MHz eingestellt sind. R1 so einstellen, daß der 5 MHz Pegel um 1 dB kleiner ist als der 4 MHz Pegel. 4. Auf gleiche Weise R1 für CH2 einstellen. Wenn die Pegel CH1 und CH2 abweichen, den höheren Pegel so einstellen, daß er auf R1 und R2 abgestimmt ist.
		TP5	R3, CH1 C13 R4, CH2 C15	•LP-Betriebsart •MH-2 HF-Ablenkung •PB	5. Das Bauteil LP ADJUST BOARD (PUJ61839) auf CN2 auf der SERVO-Platine einstellen. Die Einstellung auf gleiche Weise durchführen wie in der SP-Betriebsart CH1 und CH2. Bei TP5 die Resonanzpunkte C13 und C15 auf 5 MHz einstellen. R3 und R4 so einstellen, daß der 5 MHz Pegel um 1 dB kleiner ist als der 4 MHz Pegel. **Hinweis:** Eine Oszilloskop-Erdung an die Schild-Abdeckung anschließen.

2.4 VIDEO-SCHALTUNG

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der V/M/S MAIN Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	REC FM Pegel  Abb. 2-4-1	TP3 (REC FM) $\boxed{4}$ $\boxed{3}$ PRE REC Verstärker	R119 (REC FM ADJ)	• Farbbalken • REC • LP-Betriebsart	1. Ein Farbbalken-Eingangssignal anlegen. 2. Ein Oszilloskop an TP3 anschließen. 3. R119 so einstellen, daß der Podestpegel der vertikalen Löschkomponente 1,2 Vs-s wird. **Hinweis:** Eine Oszilloskop-Erdung an die Schild-Abdeckung anschließen.
2	VXO	TP306 (VXO)	R328 VXO	• PB • MH-2 Farbbalken • SP-Betriebsart	1. Einen Frequenzzähler an TP306 anschließen. 2. Das Farbbalkensignal des Abgleichbandes MH-2 abspielen. 3. R328 auf 4,433619 MHz ±50 Hz einstellen.
3	SP REC Farbpegel  Abb. 2-4-2	TP304	R322	• PB • SP-Betriebart • REC und dann PB • Farbbalken	1. Ein Oszilloskop an TP304 anschließen. Das Farbbalkensegment von MH-2 abspielen und den Farbsignalpegel beobachten. 2. Den Tracking-Regler (R401) an der Frontplatte auf maximalen Pegel der Farb-Hüllkurve einstellen und den höheren Farbpegel notieren. 3. Den Tracking-Regler (R401) an der Frontplatte in Mitten-Einraststellung stellen. 4. Das Farbbalkensignal aufzeichnen, und dann abspielen. Vor dem Aufnehmen R322 so einstellen, daß der Kanal mit dem höheren Pegel 85 bis 95% des notierten Pegels bei Wiedergabe wird. Jetzt bestätigen, daß der Kanalunterschied innernhalb von 3 dB liegt.
4	LP REC Farbe	TP304	R438	• PB • LP-Betriebsart • REC und dann PB • Farbbalken	1. Das Bauteil LP ADJUST BOARD (PUJ61839) an die SERVO-Platine anschließen. 2. Die Einstellung auf gleiche Weise durchführen wie bei der SP-Betriebsart. 3. Das Bauteil abnehmen. Das Farbbalkensignal aufnehmen und anschließend abspielen. Vor der Aufnahme R438 so einstellen, daß der Kanal mit dem höheren Pegel 75 bis 85% des Richtpegels bei der Wiedergabe wird. Zu diesem Zeitpunkt bestätigen, daß der Kanalunterschied innerhalb von 3 dB liegt, wie in Abb. 2-4-2 gezeigt.
5	Verzögerter Farbpegel	TP405	R401	• PB • SP-Betriebsart • MH-2 Farbbalken	1. Ein Oszilloskop an TP405 anschließen und den Signalpegel beobachten. 2. Jumperkabel zwischen TP434, TP435 und GND anschließen. Den Pegel von TP405 erneut prüfen. 3. R401 auf den gleichen Pegel einstellen.
6	0,5 H Verzögerter Videopegel	TP221 TP222	R223	• LP-Betriebsart • Farbbalken • REC und dann PB	**Hinweis:** Die Einstellung des verzögerten Videopegels 0,5 H nach der Durchführung des verzögerten Farbpegels durchführen. 1. Einen Kanal eines Doppelspur-Oszilloskops an TP222 und den anderen Kanal an TP221 anschließen. 2. R223 einstellen, um in beiden Fällen den gleichen Pegel zu erhalten.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
7	APC Fehlerphase	TP405 (PB Farbe) TP433 (7,8 kHz)	L401 (7,8 kHz Tuning)	•MH-2 Farbbalken •SP-Betriebsart	1. Eine Kabelbrücke zwischen TP436 und GND herstellen. 2. Einen Kanal eines Doppelspur-Oszilloskops an TP405 und den anderenan TP433 anschließen und die Hüllkurve beobachten. 3. L401 so einstellen, daß das Nullkreuz 30 μs + 3 μs von der Mitte des Burst-Signals gelegen ist, wie in Abb. 2-4-3 gezeigt.
	 **Abb. 2-4-3**				
8	0,5 H Verzögerter Sprung DL1	TP432 (VCO Ausgang)	R418 (0,5 H verzögerter Sprung DET)	•Kein Signal (AUX) •E-E	1. 1/2 Vm-m an TP431 anlegen. 2. Einen Frequenzzähler an TP432 anschließen. 3. R418 einstellen, um 30 ±0,2 kHz zu erhalten.
9	PB Frequenzgang und CH-Balance	MONITOR	R110 R202	•SP-Betriebsart •Farbbalken •REC und dann PB •LP-Betriebsart	1. Den SHARPNESS-Regler (R402) der OPERATION-Platine in Mitteneinraststellung stellen. 2. Ein Farbbalkensignal aufnehmen und anschließend abspielen. 3. Den Monitor beobachten und R110 auf Optimalpunkt einstellen. 4. Die Einstellung auf gleiche Weise durchführen wie in der SP-Betriebsart. 5. Den Monitor beobachten und R202 auf Optimalpunkt einstellen.
10	SECAM DET	TP310 (S DET ADJ)	L351 (1/2 fH TUNING) R355 SECAM DET. ADJ	•SECAM Farbbalken •E-E •SP-Betriebsart •REC und dann PB	1. Ein Oszilloskop an TP310 anschließen. 2. L351 so einstellen, daß der Übergangsschritt zwischen "A" und "B" zu liegen kommt, wie in Abb. 2-4-4 gezeigt. 3. Aufnehmen und dann abspielen. 4. R355 auf 6,0 ±0,5 Vs-s einstellen.
	 Diesen Punkt so einstellen, daß die Mittenposition Zwischen "A" und "B" zu liegen kommt. V = über 4 Vs-s in REC V = 6,0 ± 0,5 Vs-s in PB **Abb. 2-4-4**				

2.5 AUDIO-SCHALTUNG (0 9 AUDIO Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der AUDIO Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Vormagnetisierung	TP31 Vorspannungspegel	R20 BIAS LEVEL	• REC • SP-Betriebsart	1. Ein digitales Voltmeter zwischen TP31 und TP32 schalten. 2. Auf REC-Betriebsart ohne Signal schalten. 3. R15 auf 3,0 ±0,2 mVrms einstellen.
2	Audio PB pegel	AUDIO OUT		• REC • SP-Betriebsart	1. Ein Oszilloskop an AUDIO OUT anschließen. 2. Ein Audiosignal (−8 dBs/1 kHz an A/V CONN) an AUDIO IN anschließen und zusammen mit einem VIDEO-Signal aufnefmen, dann abspielen. 3. R5 so einstellen, daß der Audio-Ausgangspegel bei Wiedergabe −6 ±1 dB für SP-Betriebsart wird. **Hinweis:** Die PERI-Steckverbindung verwenden.

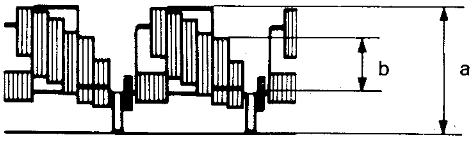
2.6 TIMER-SCHALTUNG (1 5 TIMER Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der TUNER Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Schaltuhr	TP2	C101	• E-E	1. Den Frequenzzähler an TP2 (OSC OUT) und an TP3 (GND) anschließen. 2. GND und TP1 (TEST) kurzschließen. Dann die Leitungen des Elektrolytkondensators C7 kurzschließen, wenn IC1 neu gestellt werden kann. 3. C101 auf 2048,000 Hz ±0,002 Hz (488,2813 ±0,0005 μs) einstellen. **Hinweis:** Durch Rückstellen von IC1 während TP1 und GND kurzgeschlossen sind wird die Betriebsart TEST eingeschaltet.

2.7 TUNER/IF-SCHALTUNG (0 7 TUNER/IF Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der TUNER/IF Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	VCO	MONITOR	T2	• Fernsehsendung • Tuner-Betriebsart	1. Eine Farbfernsehsendung empfangen. 2. T2 so einstellen, daß ein gutes Bild auf dem Monitor erzielt wird.
2	RF AGC	MONITOR	R11	• Fernsehsendung • Tuner-Betriebsart	**Hinweis:** R11 (RF AGC) so einstellen, daß exzessives Rauschen im Bild oder Streifenstörungen wegen starken elektrischen Feldern eliminiert werden. 1. R11 so einstellen, daß Rauschen oder Streifen auf dem Bildschirm minimiert werden. 2. Alle Kanäle im Hinblick auf Anormalität prüfen.
3	VPS Y Pegel	CN3, Pin 1 (VPS OUT)	R16	• Moduliertes Signal • Tuner-Betriebsart	1. Ein 87,5% moduliertes Signal empfangen. R16 so einstellen, daß ein maximaler Y-Pegel (einschließliche Sync) vpm 2,0 Vs-s von Pin 1 (VPS OUT) von CN3 erhalten wird.
4	Farbpegel  Y-Pagel = 1 Magenta-Pegel = 0,48 a : b = 1 : 0,48 **Abb. 2-7-1**	IC1-18 oder TP110 (VIDEO OUT)	R42	• Fernsehsendung • Tuner-Betriebsart	1. Ein Farbbalkensignal von einem Farbfernseh-Signalgenerator anlegen und den Kanal entsprechend dem Generator einstellen. 2. R42 zur Erzeugung einer Einzelhüllkurve einstellen wie in Abb. 2-7-1 gezeigt. Alternativmethode 1. Eine Farbfernsehsendung empfangen. 2. R42 so einstellen, daß der Burst-Pegel 2/3 des Synch-Pegels wird.